

Historic, Archive Document

Do not assume content reflects current scientific knowledge, policies, or practices.

Reserve
aSB205
.S7S69
1998

SOYBEAN ASIAN GERMPLASM EVALUATION

PROJECT SAGE

**AGRONOMIC PERFORMANCE OF EXOTIC
ACCESSIONS IN THE U.S.**

1998

**United States Department of Agriculture-Agricultural Research Service
North Carolina State University
Pioneer Hi-Bred International
Monsanto Global Seed Group
University of Illinois
University of Maryland
University of Arkansas
University of Minnesota
University of Georgia**

**SUPPORTED BY:
UNITED SOYBEAN BOARD**

United States
Department of
Agriculture

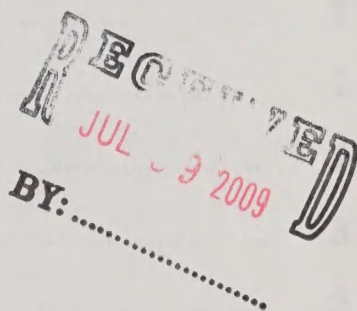


NATIONAL
AGRICULTURAL
LIBRARY

Advancing Access to
Global Information for
Agriculture

SOYBEAN ASIAN GERMPLASM EVALUATION (SAGE): AGRONOMIC PERFORMANCE OF EXOTIC ACCESSIONS IN THE U.S.

1998



COORDINATED BY

**T.E. Carter Jr., B.R. McCollum, R.L. Nelson,
R.E. Freestone, and K.W. Matson**

PARTICIPANTS IN FIELD TESTS

**T.E. Carter Jr.
R.L. Nelson
R.E. Freestone
W.J. Kenworthy
C.H. Sneller
J.H. Orf
H.R. Boerma
T.C. Corbin
D.K. Steiger
L.G. Streit
R.W. Dougherty**

**J.D. Hicks
J. Thompson
B.R. Hedges
W.K. Rhodes
K.W. Matson
A.D. Nickell
F.G. Hancock
R. L. Lussenden
C.K. Moots
D.H. Beighly**

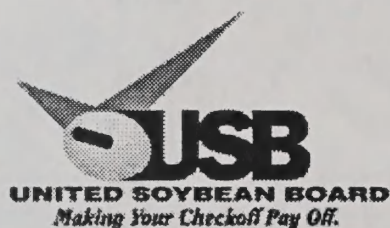
**United States Department of Agriculture-Agricultural Research Service
North Carolina State University
Pioneer Hi-Bred International
Monsanto Global Seed Group
University of Illinois
University of Maryland
University of Arkansas
University of Minnesota
University of Georgia**

This project was supported by the
UNITED SOYBEAN BOARD
(USB Project 9211)

in cooperation with the

USDA-ARS

and other agencies listed on the cover of this document.



All accessions reported here are freely available for hybridization from the USDA-ARS Soybean Germplasm Collection and may be obtained by request from Randall Nelson *via* email at rlnelson@uiuc.edu or *via* FAX at 217-333-4639.

ACKNOWLEDGEMENT

The authors thank Consuelo Arellano for her assistance in the use of SAS.

TABLE OF CONTENTS

	<u>Page</u>
ABOUT PROJECT SAGE	1
RATIONALE FOR THE PROJECT	1
SUMMARY OF RESULTS	2
METHODS	3
MOST PROMISING ASIAN ACCESSIONS.....	5
ALL ACCESSIONS TESTED IN 1998.....	6
LOCATIONS OF SAGE TRIALS IN 1998.....	9

INDIVIDUAL YIELD TRIALS

TEST 1 (primarily Maturity Group I and Earlier)	
Summary across locations in 1998.....	10
Individual locations in 1998	14
TEST 2 (primarily Maturity Group II)	
Summary across locations in 1998.....	22
Individual locations in 1998	26
TEST 3 (primarily Maturity Group III and IV)	
Summary across locations in 1998.....	34
Individual locations in 1998	38
TEST 5 (primarily Maturity Group IV and V)	
Summary across locations in 1998.....	46
Individual locations in 1998	52
TEST 6 (primarily Maturity Group V and Later)	
Summary across locations in 1998.....	60
Individual locations in 1998	64

ABOUT PROJECT SAGE

The SAGE Project (Soybean Asian Germplasm Evaluation) is a farmer-private sector-public sector initiative to increase the yield and genetic diversity of U.S. soybean. The mission of the project is to identify high-yielding exotic soybean accessions for use in U.S. variety development programs. Project SAGE is a follow-up of Project SAVE (Soybean Asian Variety Evaluation). The SAVE project began in 1996 with the field evaluation of 93 modern Asian varieties at 28 U.S. locations. In 1997, the SAVE project continued with field evaluation of 108 Asian varieties tested at 34 U.S. locations. In 1998, the SAVE project was expanded to the present SAGE by including not only modern Asian varieties, but also other promising accessions in the USDA collection. 137 exotic accessions were tested in project SAGE at 24 locations in 1998. This booklet summarizes agronomic performance of these exotic accessions.

The extensive SAGE field testing program is coordinated and partially financed through grants from the United Soybean Board. Yield trials were conducted by Pioneer Hi-Bred International, Inc., Monsanto Global Seed Group, the USDA-ARS, and the Universities of Illinois, Maryland, Minnesota, Georgia, and Arkansas, and N.C. State University.

RATIONALE FOR THE PROJECT

Soybean breeding is a true success story in U.S. agriculture. Since World War II, soybean breeding has raised farm yields 25% and provided farmers with genetic protection for an array of important diseases. The current vitality enjoyed by the soybean industry is due largely to successes in the breeding arena. More than 40 commercial companies and public institutions now develop varieties for the 70+ million acres of U.S. soybean.

Despite the remarkable achievements of U.S. soybean breeding, it is more difficult each year to maintain a competitive edge against international producers. U.S. breeders are attempting to solve this problem. One important tactic in the U.S. breeding effort has been to diversify strategies to produce superior varieties. Breeding for disease resistance, also known as defensive breeding, is one important strategy and provides outstanding varieties with nematode, virus and other resistances. Molecular transformation, a second avenue, is the newest breeding strategy and provides economically important genes not available through conventional breeding. The Roundup Ready varieties, now widely available, result from molecular research.

A third strategy for breeding progress, known as offensive breeding, boosts yield potential in the absence of pests and weeds. This type of breeding has been very important to yield improvement in the U.S. Current research suggests that U.S. breeders now have the opportunity to enhance our offensive breeding capabilities by tapping into the reservoir of global genetic diversity that exists in soybean. The purpose of this report is to help breeders do just this. The SAGE project seeks to identify agronomically important exotic germplasm for offensive breeding purposes. Such exotic germplasm has a strong likelihood of containing novel yield genes which can raise the yield ceiling for U.S. soybean varieties. The expansion of our current offensive breeding efforts in this way will be an important part of the competitive edge in U.S. soybean production in the future.

The origin of the current SAGE project traces to a small cooperative research program among U.S. soybean breeders which began in 1978. Continuing into the early 1990's, many public and private soybean breeders participated in an ongoing cooperative effort to test exotic germplasm lines from the USDA Soybean Germplasm Collection. Over the 15-year span of the effort, about 2,000 lines (mostly of unknown relation to U.S. varieties) were tested on limited basis in a series of field trials, and some of these accessions were identified as having relatively good yields compared to commercial varieties. The application of these initial positive results to practical breeding was limited; however, because most breeders had no experience in the breeding of exotic germplasm and were unsure of the agronomic benefits to the farmer. As a result, there was insufficient follow-up validation of the agronomic potential of these exotic materials.

Recently, the exotic germplasm lines from these cooperative trials have attracted renewed interest in the breeding sector. The reasons for the renewed interest are 1) hypotheses that novel yield genes reside in such exotic germplasm, 2) availability of new DNA technology that helps us identify yield genes from such germplasm, and 3) the ability to establish molecular genetic-distance relationships between exotic germplasm and U.S. breeding stock. The present SAGE test was initiated to confirm the agronomic and genetic potential of the promising germplasm lines identified through these earlier cooperative yield trials. The specific objectives of the SAGE project were to evaluate, in multi-location trials, the best lines identified in the above-mentioned cooperative tests of exotic germplasm, to collect data on yield, seed composition, and other useful agronomic traits, to compare the performance of these lines with the best available U.S. and Asian varieties, and to characterize each line with SSR markers to estimate the genetic relationships among the exotic germplasm and U.S. modern and ancestral varieties. The agronomic and seed composition data is presented in this publication.

SUMMARY OF RESULTS

OVERVIEW. Through the SAGE project, 137 exotic accessions were tested under U.S. growing conditions at 24 locations in 1998. An overall summary of the most promising accessions is provided in Table 1. A detailed description of the agronomic performance can be found for each entry by referring to the tables for each SAGE trial (refer to Table of Contents for page numbers). More detailed information about each accession can be obtained from the National Plant Germplasm System (NPGS) GRIN (Germplasm Resources Information Network) website at <http://www.ars-grin.gov/npgs/>. To search for details on a specific accession, go to http://www.ars-grin.gov/npgs/acc/acc_queries.html and enter the Plant Introduction number you wish to learn more about (make sure to put a space between PI and the number, ex: PI 416937).

Field evaluations were accomplished by organizing accessions into a series of yield trials based on their maturity. Table 2 is a list of all accessions tested in SAGE in 1998, their maturity group, and the test in which they appeared (ordered by Forage Crop (FC) or Plant Introduction (PI) number). Table 3 lists the locations of each trial in 1998. The remainder of the booklet summarizes individual yield trials and general agronomic characteristics of the accessions.

A total of 39 accessions yielded at least 80% of the U.S. checks of similar maturity, with 7 yielding 90% or more (see Table 1). These newly identified accessions appear very promising as breeding stock for U.S. variety development. Detailed agronomic performance of these

accessions (lodging, seed size, etc.) is found in the individual summaries of yield trials described below. It is our hope that all U.S. breeders will give these new genetic resources serious attention.

All accessions reported here are freely available for hybridization from the USDA-ARS Soybean Germplasm Collection and may be obtained by request from Randall Nelson *via* email at rlnelson@uiuc.edu or *via* FAX at 217-333-4639.

METHODS

Entries, Tests, And Locations. In 1998 a total of 137 soybean accessions (from China, Japan, Egypt, Nepal, France, Hungary, Romania, Yugoslavia, Russia, Korea, U.S., Morocco, India, South Africa, and Zambia) were evaluated. These accessions were divided into five tests and compared to elite public and private U.S. varieties. The five tests were named Test 1, Test 2, Test 3, Test 5 and Test 6 where the digit in the name refers to the approximate maturity group of the materials in the test. For example, Test 1 contains varieties predominantly of maturity group I and earlier.

Yield trials took place at 24 sites during 1998 in Minnesota, Wisconsin, Illinois, Iowa, Ohio, Maryland, Arkansas, Mississippi, North Carolina, and Georgia. At least five locations were grown for each test with two replications per test. However, some sites were lost due to flooding or drought. See Table 3 for a complete list of locations. Yield and other agronomic characteristics are presented as LSMeans (least squares means) rather than simple arithmetic means, to account for missing data. When a variety has no missing data, the LSMean and the arithmetic mean are identical. See Table 35 for an example. As far as we know, the lines reported here share no ancestors with U.S. cultivars.

Strain Designation. All accessions were identified by the Forage Crop (FC) or Plant Introduction (PI) number assigned by the USDA-ARS. Where possible, we also identified the accession by its common name. Pioneer varieties are identified by a four-digit number beginning with the number 9. Public varieties generally are named, rather than numbered, with the exceptions of IA2021 and KS4694.

Plot Size. The row spacing and number of rows per plot are listed in Table 3. In most locations the yield trials were planted in 30-inch rows, planting four rows and harvesting the two central ones. Normal local cultural practices were followed.

STATISTICAL ANALYSIS

Each individual trial was planted as a randomized complete block design with two replications. Each trial was analyzed separately and then combined across locations using SAS (SAS Institute Inc., 1985. SAS user's guide: Statistics version 6 edition. Cary, NC. 956 pp.). Variety means

are reported as adjusted means from the LSMeans option of SAS, to account for occasional missing values. Although all individual trials are reported, certain trials were excluded from the combined analysis if they exhibited exceptionally low yields, exceptionally high coefficient of variation, or, in rare cases, could not be harvested prior to widespread shattering. Details are added to the tables as footnotes. At least three locations were employed for each test.

TRAITS RECORDED

Flower and pubescence color. Recorded for each variety at all locations for quality assurance. See table footnotes for abbreviations.

Maturity date. Earliest date (September 1 = 1) at which 95% of the pods had a mature pod color.

Height. Reported as the distance from the ground to stem tip at maturity in inches based on the mean of three plants per plot for all plots.

Lodging. Reported on a scale from 1 to 5: 1 = completely erect, 5 = completely prostrate.

Shattering score. Taken at 7 to 10 days after harvest unless otherwise indicated, employing a scale from 0 to 9 as follows: 0 = none, 5 = 40-50%, 9 = 80-90% of pods in a plot shattered. Thus, shattering scores reported here did not affect yield estimates. For any plot where shattering may have occurred prior to harvest, the yield value was discarded.

Yield. Reported as bushels per acre based upon plots that were end trimmed at maturity.

100-seed weight. Reported as grams per 100 seeds.

Stem Termination. Reported as determinate (D), indeterminate (N), or semideterminate (S).

Mottling Score. Defined on a 100 seed sample basis, as the percentage of the total seed coat surface with dark pigment: 1 = none, 2 = 1-10%, 3 = 10-25%, 4 = 25-50%, 5 > 50%.

Seed Quality. Scale based on disease/rotten, wrinkled or otherwise defective seed coat, and greenish color: 1 = good seed, 5 = poor.

Protein, oil and fatty acids composition. In 1998, these characteristics were evaluated in two locations per test and one rep per location. Seed protein and oil were determined at 0% moisture level by near infrared reflectance (NIR), using an Infratec 1225 NR whole-grain analyzer (NIR Systems, Inc., Silver Spring, MD). Pioneer Hi-Bred International, Inc. provided the oil and protein evaluation.

Podwall and hilum color: Used to assure the identity of genotypes and provided by R.L. Nelson. See footnotes in each test for color abbreviations.

Table 1. Overall summary of the most promising exotic accessions from project SAGE. This table includes all exotic accessions that yielded at least 80% of the U.S. checks of similar maturity. Results are compiled from 5 separate tests grown at a minimum of 3 locations per test in 1998. For additional agronomic data refer to individual yield trial summaries listed in Table of Contents. You can also refer to the USDA-ARS GRIN (Germplasm Resources Information Network) website for more information on any accession at: http://www.ars-grin.gov/npgs/acc/acc_queries.html.

Plant Introduction Number	Accession Name ¹⁾	Country of Origin	MG ²⁾	SAGE Test Name ³⁾	Yield (bu/ac)	Yield as Percent of Check(s) ⁴⁾
PI437726	Ti-jue-baj	China	VI	6	46	95
PI398833		Korea, South	V	5	41	93
PI494851		Zambia	VI	6	47	93
PI391594	Jilin No. 8	China	I	1	54	92
PI507295		Japan	III	3	45	91
PI227328	Manchikin	Japan	III	3	45	90
PI509098		Korea, South	V	5	40	90
PI471931		Nepal	V	5	42	89
PI592923	Hei nong No. 37	China	I	1	51	88
PI399044		Korea, South	V	5	39	88
PI398976		Korea, South	V	5	39	88
PI408250		Korea, South	V	5	39	88
PI427099	Jilin No. 3	China	I	1	51	87
PI253665D		China	III	3	44	87
PI361075	Jilin No. 3	China	I	1	50	86
PI091142		China	III	3	43	86
PI424195B	ISZ-3	Hungary	I	1	50	85
PI408337		Korea, South	V	5	38	85
PI592919	He feng No. 31	China	0	1	43	84
PI297515		Hungary	II	2	45	84
PI508294		Korea, South	V	5	37	84
PI261474	Kohoju	China	II	2	45	83
PI088310		China	III	3	42	83
PI592947	Jin yi No. 9	China	IV	3	42	83
PI408339		Korea, South	V	5	37	83
PI157440	Kin-du	Korea, South	VI	6	37	83
PI361066A		Yugoslavia	I	1	48	82
PI503338	Liao dou No. 3	China	II	2	44	82
PI437863A		China	II	2	44	82
PI415074	Tie Feng 19A	China	III	3	41	82
PI091113		China	III	3	41	82
PI407975B		Korea, South	V	5	36	82
PI088295	Suzumaru	Japan	I	1	47	81
PI445837	Violeta	Romania	I	1	47	81
PI592936	Ji Dou No. 7	China	III	3	41	81
PI423928	Uda Daizu	Japan	VI	6	36	81
PI091167		China	II	2	43	80
PI593959	Jilin No. 31	China	II	2	43	80
PI290126B	Hei Ch'i	China	II	2	43	80

1) Names are not available for all germplasm tested in SAGE. Duplicate names are probably samples that were collected at different times by different people.

2) Maturity Group.

3) Name of the SAGE Test in which the PI appeared in 1998.

4) Yield as Percent of Check(s) was calculated by dividing accession yield by the yield of the appropriate check (or checks averaged together).

Table 2. List of all the accessions included in SAGE tests in 1998. Accessions are ordered by their FC (Field Crop) or PI (Plant Introduction) number. For more information regarding these accessions see the USDA-ARS GRIN (Germplasm Resources Information Network) website at <http://www.ars-grin.gov/npgs/>.

PI Number	Accession Name ¹⁾	SAGE Test in which PI appeared	Code #
FC004007B		3	10
FC029333	Laredo	3	11
FC031933		6	7
FC032175		6	8
PI068508		2	6
PI068560		3	12
PI068600		2	7
PI068658		2	8
PI070463		2	9
PI086114	Hoten Kuroheso	3	13
PI086456	Kakukwazoshi	3	14
PI088295	Suzumaru	1	8
PI088306		3	15
PI088310		3	16
PI088350	Kaiyuan	3	17
PI088447		3	18
PI088798		2	10
PI090566-1		3	19
PI091091		2	11
PI091113		3	20
PI091142		3	21
PI091167		2	12
PI091730-1		3	22
PI153309	Bergerac	3	23
PI157440	Kin-du	6	9
PI189930	Mandchurische	2	13
PI198078	Punjab-1	6	10
PI221717		6	11
PI227328	Manchikin	3	24
PI227333	Ohozyu	2	14
PI248402	Manhatan	3	25
PI253653D		2	15
PI253665D		3	26
PI261474	Kohoku	2	16
PI283331	No. 380	3	27
PI290126B	Hei Ch'i	2	17
PI297505	Ji Ti No. 5	2	18
PI297515		2	19
PI297544	Primorszkaja 529	2	20
PI361064		2	21
PI361066A		1	9
PI361075		1	10
PI361075	Jilin No. 3	1	11
PI383277	Jilin No. 5	2	22
PI391583	Jilin No. 10	1	12
PI391594	Jilin No. 8	1	13
PI398434		5	9

Table 2 Con't. List of all the accessions included in SAGE 1998 tests.
Accessions are ordered by their FC or PI number.

PI398580		5	10
PI398610		5	11
PI398612		5	12
PI398833		5	13
PI398881		3	28
PI398976		5	14
PI399044		5	15
PI399045		5	16
PI399122		5	17
PI404161	Mocinabe 7	3	29
PI407710	Foo sun No. 1	1	14
PI407720	Kao Chien Tao	2	23
PI407837		5	18
PI407910		5	19
PI407911		5	20
PI407975B		5	21
PI407993		5	22
PI407994		5	23
PI408037		5	24
PI408040-2		5	25
PI408041		5	26
PI408104		6	12
PI408219		5	27
PI408250		5	28
PI408337		5	29
PI408339		5	30
PI415074	Tie Feng 19A	3	30
PI417263	Sakyuu Ki Mame	6	13
PI417331	Shiro Pankon	5	31
PI423759		5	32
PI423773		5	33
PI423897	Tamahikari	5	6
PI423900	Aisa	5	34
PI423912	Misuzu Daizu	5	7
PI423928	Uda Daizu	6	14
PI424178B		5	35
PI424195B	ISZ-3	1	15
PI424201	Jilin No. 6	2	24
PI424390		6	15
PI424405B		3	31
PI424415		5	36
PI427099	Jilin No. 3	1	16
PI436682	Jilin No. 15	1	17
PI437640A		2	25
PI437697	Schao-hi-tschi	2	26
PI437726	Ti-jue-baj	6	16
PI437863A		2	27
PI438085		2	28
PI445830	Flora	1	18
PI445837	Violeta	1	19
PI458073		5	37
PI471931		5	38

Table 2 Con't. List of all the accessions included in SAGE 1998 tests. Accessions are ordered by their FC or PI number.

PI471938		5	39
PI494851		6	17
PI503338	Liao dou No. 3	2	29
PI506514	Akishiro	6	5
PI506651	Dai-ichi Hienuki 10-3	5	40
PI506660	Date Ao	5	41
PI507079	Nakasennari	5	42
PI507098	Nitchuu 47	5	43
PI507256	Shiro Chonkon	6	18
PI507269	Shiro Mitsu Mame	5	44
PI507295		3	32
PI507369	Touhoku 53	5	45
PI507403	Tousan 65	6	19
PI508294		5	46
PI509098		5	47
PI509106		5	48
PI511866	Nen feng No. 9	1	4
PI561388	Nakasennari	5	8
PI574477	Fen Dou No. 31	3	6
PI592919	He feng No. 31	1	5
PI592923	Hei nong No. 37	1	6
PI592936	Ji Dou No. 7	3	7
PI592946	Ji Dou No. 4	3	8
PI592947	Jin yi No. 9	3	9
PI593959	Jilin No. 31	2	4
PI593972	Ken nong No. 2	1	7
PI594172B	Gogaku	6	6
PI594304A	Tsurukogane	2	5

- 1] Names are not available for all accessions tested in SAGE. Duplicate names are probably samples that were collected at different times by different people.

Table 3. Row spacing and plot size for each test location of project SAGE in 1998. All trials were planted in two replications; however, the St. Joseph site lost rep 2 due to flooding.

LOCATION	TEST EVALUATED	ROW SPACING (inches)	ROWS PLANTED	ROWS HARVESTED	TOTAL FEET OF ROWS HARVESTED
Chatham, ONT	1	15	4	4	58
Lamberton, MN	1	30	4	2	16
Napoleon, OH	1	30	4	2	25
Redwood Falls, MN	1	30	4	2	26
Waseca, MN	1	30	4	2	16
Ames, IA	2	30	4	2	26
Cedars Falls, IA	2	30	4	2	30
Janesville, WI	2	30	4	2	26
Johnston, IA	2	30	4	2	24
Urbana, IL	2	30	4	2	20
Oxford, IN	3	30	4	2	26
Quenstown, MD	3	30	4	2	32
St. Joseph, IL	3	30	4	2	24
Stonnington, IL	3	30	2	2	30
Galeena, MD	5	30	4	2	28
Greenville, MS	5, 6	30	4	2	27
Keiser, AR	5	38	4	2	32
Kinston, NC	5, 6	30	2	2	26
Stuttgart, AR	5, 6	30	2	2	28
Plains, GA	6	30	4	2	24
Rohwer, AR	6	19	5	3	54

TEST 1

(Primarily maturity group I and Earlier)

SUMMARY ACROSS LOCATIONS IN 1998

Table 4. Morphological characteristics and origin of accessions in SAGE Test 1 (primarily maturity group I and earlier) evaluated in 1998.

Code	PI Number	Accession Name	Origin	Flower Color ¹⁾	Pubescence Color ²⁾	Stem Termin. ³⁾	Podwall Color ⁴⁾	Hilum Color ⁵⁾	Seed Coat Color ⁶⁾	Maturity Group ⁷⁾
4	PI511866	Nen feng No. 9	China	W	G	D	Br	Bf	Y	0
5	PI592919	He feng No. 31	China	W	G	D	Br	Y	Y	0
6	PI592921	Hei nong No. 37	China	W	G	D	Br	Y	Y	I
7	PI592923	Ken nong No. 2	China	P	G	D	Br	Y	Y	0
8	PI593972	Suzumaru	Japan	P	G	D	Br	Y	Y	I
9	PI088295		China	W	G	D	Tn	Y	Y	I
10	PI361066A		Yugoslavia	P	T	N	Br	Br	Y	I
11	PI361075	Jilin No. 3	China	W	G	N	Tn	Lbf	Y	I
12	PI391583	Jilin No. 10	China	W	G	D	Br	Bf	Y	II
13	PI391594	Jilin No. 8	China	P	G	N	Br	Bf	Y	II
14	PI407710	Foo sun No. 1	China	P	G	S	Br	lbf	Y	I
15	PI424195B	ISZ-3	Hungary	W	G	N	Br	Bf	Y	I
16	PI427099	Jilin No. 3	China	W	G	N	Tn	Lbf	Y	I
17	PI436682	Jilin No. 15	China	W	G	D	Tn	Y	Y	I
18	PI445830	Flora	Romania	P	T	N	Dbr	G	Y	I
19	PI445837	Violeta	Romania	P	T	N	Br	Y	Y	I

¹⁾ P= Purple, W= White, Dp= Dark purple.

²⁾ G= Gray, T= Tawny.

³⁾ D= Determinate, N= Indeterminate.

⁴⁾ Br= Brown, Tn= Tan, Dbr= Dark Brown.

⁵⁾ Y= Yellow, Bf= Buff, Lbf= Light buff, lbf= Imperfect Black, Br= Brown, G= Green.

⁶⁾ Y= Yellow, Lgnr= Light green.

⁷⁾ Maturity group assigned by USDA Soybean Germplasm Collection.

Table 5. Overall agronomic performance of Asian soybean varieties in the SAGE Test 1 (primarily maturity group I and earlier) evaluated in 1998. Means are presented as LSMeans from the GLM procedure of SAS ¹⁾.

Code	PI Number	Yield (bu/a) ²⁾	Maturity (Sept 1=1)	Plant Height (in)	Lodging (1 to 5) ³⁾	100-Seed Weight (g)	Seed Quality (1 to 5) ³⁾	Shattering (0 to 9) ⁴⁾	Mottling (1 to 5) ³⁾
1	9171	59.4	13	34	1.4	17.2	1.5	.	.
2	Lambert	51.5	9	33	1.7	17.4	2.1	.	.
3	Parker	57.6	17	41	2.7	18.3	2.5	.	.
4	PI511866	35.3	6	28	1.9	19.1	2.0	.	.
5	PI592919	43.2	9	30	2.0	17.0	2.8	.	.
6	PI592923	51.2	18	32	2.4	21.5	3.3	.	.
7	PI593972	35.9	6	26	1.4	20.0	2.4	.	.
8	PI088295	47.1	19	26	1.3	12.0	2.0	.	.
9	PI361066A	48.1	16	32	3.1	23.1	3.0	.	.
10	PI361075	45.3	16	32	3.4	12.4	2.3	.	.
11	PI361075	50.3	20	38	2.0	15.5	1.5	.	.
12	PI391583	45.8	21	37	3.4	16.8	2.8	.	.
13	PI391594	54.1	19	37	2.1	19.4	2.3	.	.
14	PI407710	40.7	15	30	4.4	20.3	4.0	.	.
15	PI424195B	50.0	14	35	1.9	15.5	2.0	.	.
16	PI427099	50.8	20	40	2.1	16.1	1.8	.	.
17	PI436682	45.3	17	35	3.2	17.2	2.8	.	.
18	PI445830	46.1	16	37	2.9	15.3	2.3	.	.
19	PI445837	47.4	17	36	3.1	13.7	2.0	.	.

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 5 edition. Cary, NC. 956 pp.

²⁾ Five locations were used in calculating the yield LSMean, ~~see~~ individual location tables for the rest of the traits.

³⁾ 1=best, 5=worst.

⁴⁾ 0=none; 9=80-90% shattering. Shattering occurred after harvest and thus, did not affect yield results.

Table 6. Seed protein, oil and fatty acid analysis of exotic soybean varieties in the SAGE Test 1 (primarily maturity group I and earlier) evaluated in 1998. Individual values are the average of 3 locations (one replication per location) and reported as LSMeans from the GLM procedure of SAS ¹⁾.

CODE	Entry	Oil	Pro	Fatty Acid Composition ²⁾					Total Sats. ³⁾
				16:0	18:0	18:1	18:2	18:3	
				%					
1	P9171	22.0	40.6	9.8	3.8	24.1	55.2	7.1	13.7
2	LAMBERT	22.6	43.0	11.4	4.5	21.7	55.6	6.7	15.9
3	PARKER	22.2	41.9	10.7	4.5	26.6	51.6	6.7	15.2
4	PI511866	22.2	42.1	10.6	4.4	30.2	48.5	6.3	15.0
5	PI592919	20.1	41.1	12.3	4.1	19.5	55.9	8.1	16.4
6	PI592921	21.3	42.8	10.3	4.4	29.2	49.8	6.2	14.7
7	PI592923	20.6	41.0	13.1	4.3	24.6	50.6	7.4	17.4
8	PI593972	20.1	40.8	10.8	4.1	24.4	53.4	7.3	14.9
9	PI088295	20.6	44.2	11.4	3.9	27.0	50.4	7.4	15.3
10	PI361066A	19.5	43.3	11.7	4.1	24.1	52.8	7.3	15.7
11	PI361075	18.7	41.8	10.6	4.5	30.5	48.3	6.0	15.1
12	PI391583	21.5	43.0	10.6	4.4	26.6	52.1	6.2	15.0
13	PI391594	20.7	42.1	10.5	4.6	26.1	51.3	7.5	15.1
14	PI407710	22.5	42.4	10.8	3.9	25.6	52.4	7.3	14.7
15	PI424195B	20.4	42.4	11.7	3.7	24.4	52.8	7.4	15.4
16	PI427099	18.5	41.1	10.3	4.8	25.8	52.4	6.7	15.1
17	PI436682	21.4	43.1	11.0	4.1	23.7	53.9	7.2	15.1
18	PI445830	21.7	42.1	11.0	4.4	22.8	54.7	7.2	15.4
19	PI445837	21.9	41.9	10.2	3.9	21.6	56.6	7.6	14.2
LSMEAN		21.0	42.1	11.0	4.2	25.2	52.5	7.0	15.2

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ 16:0=Palmitic acid; 18:0=Stearic acid; 18:1=Oleic acid; 18:2=Linoleic acid; 18:3=Linolenic acid.

³⁾ Total of saturated fatty acids (16:0 + 18:0).

TEST 1

(Primarily maturity group I and Earlier)

INDIVIDUAL LOCATIONS IN 1998

Table 7. Yield (bu/a) of soybean accessions in SAGE Test 1 (primarily maturity group I and earlier) evaluated in 1998. Means are presented as LSMeans from the GLM procedure of SAS ¹⁾.

Code	Name	Chatham, ONT	Lamberton, MN	Napoleon, OH	Redwood Falls, MN	Waseca, MN	LSMean
1	9171	54.0	56.7	60.3	62.3	63.9	59.4
2	Lambert	60.1	41.8	45.7	55.4	54.8	51.5
3	Parker	64.5	48.3	57.3	57.2	61.0	57.6
4	PI511866	41.5	21.8	37.0	36.8	39.4	35.3
5	PI592919	46.4	35.3	39.1	50.4	44.9	43.2
6	PI592923	66.5	40.0	50.6	53.1	45.9	51.2
7	PI593972	44.2	23.9	38.7	35.4	37.5	35.9
8	PI088295	51.0	39.7	47.9	49.7	47.2	47.1
9	PI361066A	49.3	46.1	48.6	50.2	46.5	48.1
10	PI361075	49.8	38.0	41.2	54.5	42.8	45.3
11	PI361075	63.7	39.6	47.1	56.2	44.9	50.3
12	PI391583	52.8	33.0	48.0	54.4	41.1	45.8
13	PI391594	63.1	47.1	50.4	57.7	52.1	54.1
14	PI407710	48.2	40.7	41.5	42.7	30.6	40.7
15	PI424195B	64.2	45.9	45.0	50.0	45.1	50.0
16	PI427099	60.6	42.0	51.2	54.1	45.9	50.8
17	PI436682	53.6	34.8	43.4	52.9	42.0	45.3
18	PI445830	55.7	43.1	44.5	41.2	46.2	46.1
19	PI445837	61.0	37.5	45.1	48.9	44.3	47.4
LSMean		55.3	39.7	46.4	50.7	46.1	47.6
LSD(0.05) ²⁾		13.3	11.1	5.2	11.5	10.3	4.5
CV (%)		11	13	5	11	11	11

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ A single LSD value is given for each location although LSMeans are presented. The average LSD's values closely approximate the individual pairwise LSD's obtained from the LSMeans provided by SAS.

Table 8. Maturity Date (September 1 = 1) of soybean accessions in SAGE Test 1 (primarily maturity group I and earlier) evaluated in 1998. Means are presented as LSMeans from the GLM procedure of SAS ¹⁾.

Code	Name	Chatham, ONT	Lamberton, MN	Napoleon, OH	Redwood Falls, MN	Waseca, MN	LSMean
1	9171	7	16	13	18	14	13
2	Lambert	5	8	11	13	9	9
3	Parker	17	16	17	19	18	17
4	PI511866	-1	6	2	13	9	6
5	PI592919	4	11	8	13	11	9
6	PI592923	15	20	17	22	19	18
7	PI593972	0	6	4	12	9	6
8	PI088295	13	21	14	24	21	19
9	PI361066A	11	20	12	21	19	16
10	PI361075	14	18	10	19	17	16
11	PI361075	16	22	14	25	22	20
12	PI391583	17	22	18	27	22	21
13	PI391594	13	22	16	24	22	19
14	PI407710	12	16	11	22	17	15
15	PI424195B	12	16	12	19	14	14
16	PI427099	17	21	17	24	22	20
17	PI436682	14	15	13	25	18	17
18	PI445830	11	18	14	22	15	16
19	PI445837	13	21	15	20	17	17
LSMean		11	16	13	20	17	16

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

Table 9. Plant Height (inches) of soybean accessions in SAGE Test 1 (primarily maturity group I and earlier) evaluated in 1998. Means are presented as LSMeans from the GLM procedure of SAS ¹⁾.

Code	Name	Chatham, ONT ²⁾	Lamberton, MN	Napoleon, OH	Redwood Falls, MN	Waseca, MN	LSMean
1	9171	.	37	31	34	35	34
2	Lambert	.	36	29	34	33	33
3	Parker	.	40	43	39	43	41
4	PI511866	.	31	23	31	27	28
5	PI592919	.	32	27	32	31	30
6	PI592923	.	30	31	34	32	32
7	PI593972	.	28	22	25	28	26
8	PI088295	.	25	21	28	30	26
9	PI361066A	.	34	31	34	32	32
10	PI361075	.	33	29	32	34	32
11	PI361075	.	42	32	38	41	38
12	PI391583	.	39	32	40	38	37
13	PI391594	.	39	35	37	37	37
14	PI407710	.	29	29	33	30	30
15	PI424195B	.	38	33	34	36	35
16	PI427099	.	42	38	37	43	40
17	PI436682	.	33	32	36	38	35
18	PI445830	.	39	35	36	38	37
19	PI445837	.	39	32	37	37	36
LSMean		.	35	31	34	35	34

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ This trait was not recorded at this location in 1998.

Table 10. Plant Lodging score (1=erect, 5=prostrate) of soybean accessions in SAGE Test 1 (primarily maturity group I and earlier) evaluated in 1998. Means are presented as LSMeans from the GLM procedure of SAS ¹⁾.

Code	Name	Chatham, ONT ²⁾	Lamberton, MN	Napoleon, OH	Redwood Falls, MN	Waseca, MN	LSMean
1	9171	.	2.0	1.5	1.0	1.0	1.4
2	Lambert	.	3.0	2.0	1.0	1.0	1.7
3	Parker	.	4.0	2.5	2.0	2.5	2.7
4	PI511866	.	4.0	1.5	1.0	1.0	1.9
5	PI592919	.	3.0	2.5	1.0	1.5	2.0
6	PI592923	.	3.0	2.5	1.0	3.0	2.4
7	PI593972	.	2.0	1.5	1.0	1.0	1.4
8	PI088295	.	2.0	1.0	1.0	1.0	1.3
9	PI361066A	.	3.0	3.5	3.0	3.0	3.1
10	PI361075	.	4.0	4.0	3.0	2.5	3.4
11	PI361075	.	2.5	3.0	1.5	1.0	2.0
12	PI391583	.	4.0	3.5	3.0	3.0	3.4
13	PI391594	.	3.0	2.5	1.5	1.5	2.1
14	PI407710	.	4.0	4.5	4.5	4.5	4.4
15	PI424195B	.	3.0	2.0	1.0	1.5	1.9
16	PI427099	.	3.5	2.5	1.5	1.0	2.1
17	PI436682	.	4.0	4.5	2.0	2.5	3.2
18	PI445830	.	4.0	3.5	1.5	2.5	2.9
19	PI445837	.	4.0	4.5	2.5	1.5	3.1
LSMean		.	3.3	2.8	1.8	1.9	2.4

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ This trait was not recorded at this location in 1998.

Table 11. Seed Weight (g/100 seed) of soybean accessions in SAGE Test 1 (primarily maturity group I and earlier) evaluated in 1998. Means are presented as LSMeans from the GLM procedure of SAS ¹⁾.

Code	Name	Chatham, ONT ²⁾	Lamberton, MN	Napoleon, OH	Redwood Falls, MN ²⁾	Waseca, MN	LSMean
1	9171	.	16.5	17.8	.	17.3	17.2
2	Lambert	.	16.6	18.5	.	17.1	17.4
3	Parker	.	16.3	20.2	.	18.6	18.3
4	PI511866	.	17.5	20.8	.	19.0	19.1
5	PI592919	.	15.7	18.5	.	16.8	17.0
6	PI592923	.	20.3	22.6	.	21.5	21.5
7	PI593972	.	19.3	20.9	.	19.7	20.0
8	PI088295	.	11.0	12.2	.	12.9	12.0
9	PI361066A	.	23.0	23.8	.	22.6	23.1
10	PI361075	.	11.5	13.6	.	12.1	12.4
11	PI361075	.	15.3	16.4	.	14.7	15.5
12	PI391583	.	15.0	19.0	.	16.3	16.8
13	PI391594	.	18.0	20.3	.	20.0	19.4
14	PI407710	.	19.9	20.0	.	21.0	20.3
15	PI424195B	.	15.0	17.3	.	14.1	15.5
16	PI427099	.	15.4	16.9	.	15.8	16.1
17	PI436682	.	15.7	18.3	.	17.6	17.2
18	PI445830	.	14.7	16.1	.	15.2	15.3
19	PI445837	.	13.2	13.7	.	14.2	13.7
LSMean		.	16.3	18.3	.	17.2	17.2

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ This trait was not recorded at this location in 1998.

Table 12. Seed Quality score (1=good, 5=poor) of soybean accessions in SAGE Test 1 (primarily maturity group I and earlier) evaluated in 1998. Means are presented as LSMeans from the GLM procedure of SAS ¹⁾.

Code	Name	Chatham, ONT ²⁾	Lamberton, MN	Napoleon, OH ²⁾	Redwood Falls, MN ²⁾	Waseca, MN	LSMean
1	9171	.	1.5	.	.	1.5	1.5
2	Lambert	.	1.8	.	.	2.5	2.1
3	Parker	.	2.5	.	.	2.5	2.5
4	PI511866	.	2.0	.	.	2.0	2.0
5	PI592919	.	2.5	.	.	3.0	2.8
6	PI592923	.	3.5	.	.	3.0	3.3
7	PI593972	.	2.8	.	.	2.0	2.4
8	PI088295	.	2.0	.	.	2.0	2.0
9	PI361066A	.	3.0	.	.	3.0	3.0
10	PI361075	.	2.5	.	.	2.0	2.3
11	PI361075	.	1.5	.	.	1.5	1.5
12	PI391583	.	3.0	.	.	2.5	2.8
13	PI391594	.	2.0	.	.	2.5	2.3
14	PI407710	.	4.0	.	.	4.0	4.0
15	PI424195B	.	2.0	.	.	2.0	2.0
16	PI427099	.	2.0	.	.	1.5	1.8
17	PI436682	.	3.0	.	.	2.5	2.8
18	PI445830	.	2.5	.	.	2.0	2.3
19	PI445837	.	2.5	.	.	1.5	2.0
LSMean		.	2.5	.	.	2.3	2.4

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ This trait was not recorded at this location in 1998.



TEST 2

(Primarily maturity group II)

SUMMARY ACROSS LOCATIONS IN 1998

Table 13. Morphological characteristics and origin of accessions in SAGE Test 2 (primarily maturity group II) evaluated in 1998.

Code	PI Number	Accession Name	Origin	Flower Color ¹⁾	Pubescence Color ²⁾	Stem Termin. ³⁾	Podwall Color ⁴⁾	Hilum Color ⁵⁾	Seed Coat Color ⁶⁾	Maturity Group ⁷⁾
4	PI593959	Jilin No. 31	China	P	G	D	Br	Bf	Y	II
5	PI594304A	Tsurukogane	Japan	W	G	N	Br	Y	Y	I
6	PI068508		China	W	G	D	Br	Bf	Y	II
7	PI068600		China	P	G	N	Br	lb	Y	II
8	PI068658		China	P	G	S	Br	lb	Y	II
9	PI070463		China	W	G	N	Dbr	Bf	Y	II
10	PI088798		China	W	Lt	S	Br	Bl	Y	II
11	PI091091		China	W	G	S	Tn	Y	Y	II
12	PI091167		China	W	G	N	Br	Y	Y	II
13	PI189930	Mandchurische	France	W	G	D	Br	Lbf	Y	II
14	PI227333	Ohozyu	Japan	W	G	D	Br	Lbf	Y	II
15	PI253653D		China	W	G	D	Br	Bf	Y	I
16	PI261474	Kohoju	China	W	G	D	Br	Y	Y	II
17	PI290126B	Hei ch'i	China	W	T	N	Br	Br	Y	II
18	PI297505	Ji ti No. 5	China	W	G	N	Br	Lbf	Y	I
19	PI297515		Hungary	W	G	N	Tn	Y	Y	II
20	PI297544	Primorskaja 529	Russia	W	G	N	Br	Lbf	Y	II
21	PI361064		Yugoslavia	W	T	N	Br	Br	Y	II
22	PI383277	Jilin No. 5	China	W	G	N	Dbr	Y	Y	II
23	PI407720	Kao chien tao	China	W	G	S	Br	Y	Y	II
24	PI424201	Jilin No. 6	China	W	G	D	Br	Bf	Y	II
25	PI437640A		China	P	G	N	Tn	Lg	Lg	I
26	PI437697	Schao-hi-tschi	China	W	Lt	N	Bl	Bl	Y	II
27	PI437863A		China	W	G	N	Br	Lbf	Y	II
28	PI438085		China	P	G	N	Dbr	Lbf	Y	II
29	PI503338	Liao dou No. 3	China	P	G	N	Tn	Y	Y	II

¹⁾ P= Purple, W= White, Dp= Dark purple.

²⁾ G= Gray, T= Tawny.

³⁾ D= Determinate, N= Indeterminate.

⁴⁾ Br= Brown, Tn= Tan, Dbr= Dark Brown.

⁵⁾ Y= Yellow, Bf= Buff, Lbf= Light buff, lb= Imperfect Black, Br= Brown.

⁶⁾ Y= Yellow, Lgnr= Light green.

⁷⁾ Maturity group assigned by USDA Soybean Germplasm Collection.

Table 14. Overall agronomic performance of Asian soybean varieties in the SAGE Test 2 (primarily maturity group II) evaluated in 1998. Means are presented as LSMeans from the GLM procedure of SAS ¹⁾.

Code	PI Number	Yield (bu/a) ²⁾	Maturity (Sept 1=1)	Plant Height (in)	Lodging (1 to 5) ³⁾	100-Seed Weight (g)	Seed Quality (1 to 5) ³⁾	Shattering (0 to 9) ⁴⁾	Mottling (1 to 5) ³⁾
1	9254	56.3	14	31	3.6	13.0	2.2	.	2.0
2	IA2021	51.3	13	30	8.4	15.6	2.0	.	2.0
3	Savoy	53.6	16	31	6.2	16.2	1.8	.	2.0
4	PI593959	43.0	15	39	11.0	18.8	2.0	.	1.5
5	PI594304A	41.6	15	28	7.6	27.9	2.7	.	2.0
6	PI068508	39.5	14	32	12.4	14.5	1.8	.	1.0
7	PI068600	39.9	13	36	11.0	14.4	2.0	.	1.5
8	PI068658	37.9	12	32	12.2	15.2	1.8	.	1.5
9	PI070463	38.9	17	34	11.4	17.8	2.2	.	1.5
10	PI088798	39.0	13	30	9.8	23.9	2.3	.	1.5
11	PI091091	40.9	21	32	10.2	17.2	1.9	.	1.5
12	PI091167	42.8	14	34	10.4	21.1	2.3	.	1.0
13	PI189930	39.6	14	34	10.9	20.8	2.5	.	2.0
14	PI227333	41.4	14	33	10.2	22.1	2.5	.	2.0
15	PI253653D	36.1	14	30	11.6	15.1	2.2	.	1.5
16	PI261474	44.6	14	33	10.5	22.8	2.1	.	2.0
17	PI290126B	43.0	15	33	10.1	20.3	2.0	.	1.5
18	PI297505	40.0	15	36	11.0	16.3	1.8	.	2.0
19	PI297515	44.9	12	32	10.3	17.6	1.8	.	1.5
20	PI297544	41.0	15	33	10.6	22.3	2.5	.	1.5
21	PI361064	42.0	17	35	10.4	11.2	1.6	.	3.0
22	PI383277	42.6	17	39	12.4	17.8	2.1	.	2.0
23	PI407720	40.6	15	30	11.5	18.7	2.2	.	1.5
24	PI424201	39.0	15	28	11.2	15.0	1.5	.	1.0
25	PI437640A	38.4	10	33	9.9	17.0	1.8	.	2.5
26	PI437697	42.7	16	42	11.3	15.0	2.9	.	4.0
27	PI437863A	44.2	17	34	10.9	15.9	2.2	.	1.5
28	PI438085	41.1	16	39	12.2	16.5	2.4	.	1.5
29	PI503338	44.0	15	37	10.6	15.9	2.1	.	2.0

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 5 edition. Cary, NC. 956 pp.

²⁾ Five locations were used in calculating the yield LSMeans, see individual location tables for the rest of the traits.

³⁾ 1=best, 5=worst.

⁴⁾ 0=none; 9=80-90% shattering. Shattering occurred after harvest and thus, did not affect yield results.

Table 15. Seed protein, oil and fatty acid analysis of exotic soybean varieties in the SAGE Test 2 (primarily maturity group II) evaluated in 1998. Individual values are the average of 3 locations (one replication per location) and reported as LSMeans from the GLM procedure of SAS ¹⁾.

CODE	Entry	Oil	Pro	Fatty Acid Composition ²⁾					Total Sats. ³⁾
				16:0	18:0	18:1	18:2	18:3	
				%					
1	P9254	22.0	40.9	10.6	4.2	24.7	53.5	7.1	14.8
2	IA2021	21.2	41.3	10.7	4.3	22.2	55.7	7.1	15.0
3	SAVOY	20.7	42.5	10.3	3.9	24.7	53.5	7.5	14.2
4	PI593959	20.2	41.4	11.2	4.3	24.5	52.2	7.9	15.5
5	PI594304A	19.1	42.9	10.3	3.7	30.0	49.4	6.6	14.0
6	PI068508	20.8	41.2	10.5	4.4	24.7	53.5	7.1	14.8
7	PI068600	17.4	45.9	9.8	3.7	22.6	56.5	7.5	13.5
8	PI068658	20.5	43.0	10.5	3.7	26.4	52.4	7.1	14.2
9	PI070463	21.4	42.6	10.0	4.2	31.4	48.3	6.2	14.2
10	PI088798	20.0	43.2	10.4	4.7	30.6	48.2	6.2	15.1
11	PI091091	20.5	42.3	10.8	3.9	25.1	52.5	7.6	14.7
12	PI091167	20.7	42.7	10.7	3.6	25.7	52.9	7.2	14.3
13	PI189930	20.6	41.8	10.4	4.0	24.9	53.3	7.5	14.4
14	PI227333	21.3	42.4	10.3	3.7	26.7	52.2	7.1	14.0
15	PI253653D	20.2	43.1	10.0	4.1	23.4	55.3	7.4	14.1
16	PI261474	20.9	42.8	10.2	3.8	27.7	51.8	6.5	14.0
17	PI290126B	20.5	43.9	10.6	3.8	29.6	49.6	6.4	14.3
18	PI297505	20.3	41.9	10.3	4.1	29.3	49.7	6.6	14.4
19	PI297515	21.0	42.7	10.8	4.0	24.6	53.3	7.3	14.8
20	PI297544	21.0	42.5	10.3	3.8	25.0	53.9	7.0	14.1
21	PI361064	18.3	39.6	11.9	4.3	23.9	52.3	7.6	16.2
22	PI383277	20.6	41.6	11.2	5.0	28.1	48.9	6.7	16.2
23	PI407720	20.4	41.6	10.5	4.0	24.7	53.0	7.8	14.5
24	PI424201	19.6	43.2	9.4	4.0	30.8	49.5	6.4	13.3
25	PI437640A	19.4	43.6	11.2	3.9	24.8	52.4	7.8	15.1
26	PI437697	20.2	40.3	10.2	4.3	25.0	53.8	6.7	14.4
27	PI437863A	19.8	42.5	11.2	4.1	24.1	53.1	7.4	15.3
28	PI438085	20.9	42.5	11.1	4.0	26.3	51.4	7.4	15.1
29	PI503338	19.9	43.0	11.1	5.1	33.6	44.2	6.1	16.2
LSMEAN		20.4	42.3	10.6	4.1	26.5	51.7	7.0	14.8

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ 16:0=Palmitic acid; 18:0=Stearic acid; 18:1=Oleic acid; 18:2=Linoleic acid; 18:3=Linolenic acid.

³⁾ Total of saturated fatty acids (16:0 + 18:0).

TEST 2

(Primarily maturity group II)

INDIVIDUAL LOCATIONS IN 1998

Table 16. Yield (bu/a) of soybean accessions in SAGE Test 2 (primarily maturity group II) evaluated in 1998. Means are presented as LSMeans from the GLM procedure of SAS ¹⁾.

Code	Name	Ames, IA	Cedar Falls, IA	Janesville, WI	Johnston, IA	Urbana, IL	LSMean
1	9254	49.4	67.2	73.2	48.0	43.6	56.3
2	IA2021	48.6	49.1	70.8	44.1	44.0	51.3
3	Savoy	37.4	65.7	72.6	47.5	44.9	53.6
4	PI593959	54.9	41.7	44.3	36.7	37.5	43.0
5	PI594304A	40.5	46.5	59.4	30.9	30.9	41.6
6	PI068508	35.0	38.8	55.5	30.4	37.9	39.5
7	PI068600	36.4	42.9	48.9	32.3	39.0	39.9
8	PI068658	42.5	34.1	48.7	28.4	35.7	37.9
9	PI070463	46.1	34.6	48.0	31.8	33.9	38.9
10	PI088798	31.6	44.4	50.0	32.3	36.7	39.0
11	PI091091	36.1	46.5	55.9	31.3	34.6	40.9
12	PI091167	45.4	43.9	51.5	33.3	39.7	42.8
13	PI189930	40.5	43.4	42.8	35.3	36.2	39.6
14	PI227333	40.7	44.0	50.7	32.8	38.9	41.4
15	PI253653D	35.8	34.6	45.0	29.4	35.6	36.1
16	PI261474	42.3	53.4	55.5	32.8	39.0	44.6
17	PI290126B	39.0	45.5	55.2	34.8	40.4	43.0
18	PI297505	35.9	48.0	46.4	32.8	36.7	40.0
19	PI297515	46.4	51.2	55.8	34.8	36.5	44.9
20	PI297544	50.2	44.8	51.9	31.8	26.3	41.0
21	PI361064	45.9	40.3	54.0	35.8	33.8	42.0
22	PI383277	51.1	39.8	53.3	31.9	36.7	42.6
23	PI407720	43.2	47.6	47.1	26.5	38.4	40.6
24	PI424201	45.9	42.4	47.7	30.4	28.7	39.0
25	PI437640A	31.0	43.4	49.5	33.8	34.5	38.4
26	PI437697	44.3	46.5	53.6	34.3	34.9	42.7
27	PI437863A	47.4	49.6	56.3	29.9	38.0	44.2
28	PI438085	44.0	49.6	44.1	28.9	38.7	41.1
29	PI503338	40.6	49.7	53.7	39.1	37.1	44.0
LSMean		42.3	45.9	53.1	33.9	36.9	42.4
LSD(0.05) ²⁾		15.8	12.2	7.7	5.2	6.0	4.4
CV (%)		18	13	7	7	8	12

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ A single LSD value is given for each location although LSMeans are presented. The average LSD's values closely approximate the individual pairwise LSD's obtained from the LSMean provided by SAS.

Table 17. Maturity Date (September 1 = 1) of soybean accessions in SAGE Test 2 (primarily maturity group II) evaluated in 1998. Means are presented as LSMeans from the GLM procedure of SAS ¹⁾.

Code	Name	Ames, IA	Cedar Falls, IA	Janesville, WI	Johnston, IA ²⁾	Urbana, IL	LSMean
1	9254	15	23	16	.	14	17
2	IA2021	15	22	16	.	11	16
3	Savoy	16	25	19	.	14	18
4	PI593959	12	22	15	.	10	15
5	PI594304A	15	21	15	.	10	15
6	PI068508	7	21	17	.	12	14
7	PI068600	6	20	16	.	11	13
8	PI068658	5	21	14	.	10	12
9	PI070463	14	23	18	.	13	17
10	PI088798	7	22	15	.	8	13
11	PI091091	16	27	24	.	16	21
12	PI091167	9	21	16	.	10	14
13	PI189930	10	22	15	.	11	14
14	PI227333	9	23	15	.	9	14
15	PI253653D	9	20	16	.	11	14
16	PI261474	10	22	15	.	9	14
17	PI290126B	12	22	18	.	10	15
18	PI297505	9	22	17	.	11	15
19	PI297515	9	18	13	.	9	12
20	PI297544	10	21	15	.	13	15
21	PI361064	17	22	19	.	13	17
22	PI383277	18	21	19	.	12	17
23	PI407720	12	22	15	.	11	15
24	PI424201	10	23	16	.	13	15
25	PI437640A	0	19	14	.	7	10
26	PI437697	15	22	17	.	11	16
27	PI437863A	14	23	19	.	11	17
28	PI438085	11	23	17	.	13	16
29	PI503338	12	21	17	.	11	15
LSMean		11	22	16	.	11	15

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ This trait was not recorded at this location in 1998.

Table 18. Plant Height (inches) of soybean accessions in SAGE Test 2 (primarily maturity group II) evaluated in 1998. Means are presented as LSMeans from the GLM procedure of SAS ¹⁾.

Code	Name	Ames, IA	Cedar Falls, IA	Janesville, WI	Johnston, IA	Urbana, IL	LSMean
1	9254	30	35	36	30	26	31
2	IA2021	29	33	33	30	28	30
3	Savoy	29	38	36	25	26	31
4	PI593959	40	44	47	30	33	39
5	PI594304A	25	31	32	28	24	28
6	PI068508	27	39	42	26	29	32
7	PI068600	34	41	39	33	34	36
8	PI068658	28	39	37	32	26	32
9	PI070463	34	39	38	28	32	34
10	PI088798	26	37	38	28	24	30
11	PI091091	29	38	38	28	29	32
12	PI091167	31	37	41	33	31	34
13	PI189930	30	41	42	31	26	34
14	PI227333	29	38	42	28	28	33
15	PI253653D	28	34	36	28	23	30
16	PI261474	31	37	40	31	28	33
17	PI290126B	31	36	37	31	30	33
18	PI297505	35	40	42	30	35	36
19	PI297515	32	36	41	29	25	32
20	PI297544	30	38	47	29	22	33
21	PI361064	34	39	35	31	35	35
22	PI383277	41	44	46	33	32	39
23	PI407720	25	35	35	30	25	30
24	PI424201	24	31	36	28	21	28
25	PI437640A	30	38	37	31	31	33
26	PI437697	43	50	49	33	38	42
27	PI437863A	32	42	44	28	27	34
28	PI438085	40	41	46	32	36	39
29	PI503338	35	41	42	34	31	37
LSMean		31	38	40	30	29	33

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

Table 19. Plant Lodging score (1=erect, 5=prostrate) of soybean accessions in SAGE Test 2 (primarily maturity group II) evaluated in 1998. Means are presented as LSMeans from the GLM procedure of SAS ¹⁾.

Code	Name	Ames, IA	Cedar Falls, IA	Janesville, WI	Johnston, IA	Urbana, IL	LSMean
1	9254	1.2	1.5	1.3	1.5	1.0	1.3
2	IA2021	2.3	2.5	3.5	1.3	1.0	2.1
3	Savoy	1.5	2.3	2.5	1.3	1.0	1.7
4	PI593959	2.8	4.0	4.5	2.0	1.1	2.9
5	PI594304A	1.3	2.0	3.3	1.3	1.0	1.8
6	PI068508	3.3	4.8	5.0	3.0	1.1	3.4
7	PI068600	3.8	4.3	4.3	2.8	1.6	3.3
8	PI068658	2.0	4.8	5.0	3.3	1.2	3.2
9	PI070463	3.8	4.5	4.5	2.5	1.1	3.3
10	PI088798	1.5	2.5	4.3	1.5	1.1	2.2
11	PI091091	1.8	3.3	4.3	2.3	1.1	2.5
12	PI091167	2.3	3.0	4.3	2.8	1.2	2.7
13	PI189930	2.5	3.3	4.5	2.5	1.0	2.7
14	PI227333	2.0	3.0	4.3	2.3	1.3	2.6
15	PI253653D	2.3	5.0	4.8	2.5	1.0	3.1
16	PI261474	2.3	3.3	4.3	3.0	1.3	2.8
17	PI290126B	2.0	3.8	4.3	1.5	1.0	2.5
18	PI297505	2.3	4.0	4.5	2.8	1.2	2.9
19	PI297515	2.0	3.5	4.3	2.5	1.1	2.7
20	PI297544	2.5	2.4	4.5	2.3	1.0	2.5
21	PI361064	3.0	3.5	4.3	2.0	1.2	2.8
22	PI383277	3.7	4.3	5.0	2.3	1.5	3.3
23	PI407720	1.8	4.0	4.8	3.3	1.1	3.0
24	PI424201	1.5	3.8	4.8	2.3	1.0	2.7
25	PI437640A	2.5	3.0	4.0	2.8	1.2	2.7
26	PI437697	3.2	4.5	4.5	2.5	1.2	3.2
27	PI437863A	2.3	3.8	4.5	2.5	1.1	2.8
28	PI438085	3.0	4.0	5.0	2.3	1.7	3.2
29	PI503338	2.0	3.2	4.5	2.0	1.0	2.6
LSMean		2.3	3.5	4.2	2.3	1.2	2.9

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

Table 20. Seed Weight (g/100 seed) of soybean accessions in SAGE Test 2 (primarily maturity group II) evaluated in 1998. Means are presented as LSMeans from the GLM procedure of SAS ¹⁾.

Code	Name	Ames, IA	Cedar Falls, IA	Janesville, WI ²⁾	Johnston, IA ²⁾	Urbana, IL	LSMean
1	9254	13.3	14.8	.	.	10.9	13.0
2	IA2021	15.6	18.5	.	.	12.8	15.6
3	Savoy	16.3	18.4	.	.	13.9	16.2
4	PI593959	19.6	22.6	.	.	14.3	18.8
5	PI594304A	29.9	30.9	.	.	23.0	27.9
6	PI068508	14.4	17.1	.	.	12.0	14.5
7	PI068600	14.4	16.8	.	.	12.0	14.4
8	PI068658	15.4	18.4	.	.	11.9	15.2
9	PI070463	18.8	19.8	.	.	14.9	17.8
10	PI088798	23.6	28.6	.	.	19.5	23.9
11	PI091091	18.6	19.6	.	.	13.3	17.2
12	PI091167	21.8	23.9	.	.	17.5	21.1
13	PI189930	22.4	23.9	.	.	16.2	20.8
14	PI227333	22.7	26.5	.	.	17.1	22.1
15	PI253653D	14.6	18.5	.	.	12.3	15.1
16	PI261474	23.3	27.1	.	.	17.9	22.8
17	PI290126B	21.0	22.8	.	.	17.1	20.3
18	PI297505	15.6	19.1	.	.	14.1	16.3
19	PI297515	18.8	20.8	.	.	13.4	17.6
20	PI297544	24.0	26.2	.	.	16.9	22.3
21	PI361064	12.1	12.8	.	.	8.9	11.2
22	PI383277	19.1	19.9	.	.	14.3	17.8
23	PI407720	21.3	20.4	.	.	14.5	18.7
24	PI424201	16.4	16.6	.	.	11.9	15.0
25	PI437640A	16.5	20.0	.	.	14.6	17.0
26	PI437697	15.7	17.5	.	.	11.9	15.0
27	PI437863A	16.8	17.3	.	.	13.8	15.9
28	PI438085	17.5	17.9	.	.	14.0	16.5
29	PI503338	16.9	18.2	.	.	12.6	15.9
LSMean		18.5	20.5	.	.	14.4	17.8

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ This trait was not recorded at this location in 1998.

Table 21. Seed Quality score (1=good, 5=poor) of soybean accessions in SAGE Test 2 (primarily maturity group II) evaluated in 1998. Means are presented as LSMeans from the GLM procedure of SAS ¹⁾.

Code	Name	Ames, IA	Cedar Falls, IA	Janesville, WI ²⁾	Johnston, IA ²⁾	Urbana, IL	LSMean
1	9254	3.0	1.5	.	.	2.0	2.2
2	IA2021	2.5	1.5	.	.	2.0	2.0
3	Savoy	2.5	1.0	.	.	1.8	1.8
4	PI593959	3.0	1.5	.	.	1.5	2.0
5	PI594304A	3.0	2.0	.	.	3.0	2.7
6	PI068508	2.5	1.5	.	.	1.5	1.8
7	PI068600	3.0	1.5	.	.	1.5	2.0
8	PI068658	2.0	2.0	.	.	1.5	1.8
9	PI070463	3.0	1.5	.	.	2.0	2.2
10	PI088798	3.0	1.5	.	.	2.5	2.3
11	PI091091	2.5	1.0	.	.	2.3	1.9
12	PI091167	2.5	2.0	.	.	2.5	2.3
13	PI189930	3.0	2.0	.	.	2.5	2.5
14	PI227333	3.0	1.5	.	.	3.0	2.5
15	PI253653D	3.0	2.0	.	.	1.5	2.2
16	PI261474	2.0	1.5	.	.	2.8	2.1
17	PI290126B	2.5	1.5	.	.	2.0	2.0
18	PI297505	2.5	1.5	.	.	1.5	1.8
19	PI297515	2.0	1.5	.	.	2.0	1.8
20	PI297544	3.0	1.5	.	.	3.0	2.5
21	PI361064	2.5	1.0	.	.	1.3	1.6
22	PI383277	2.5	1.5	.	.	2.3	2.1
23	PI407720	2.5	2.0	.	.	2.0	2.2
24	PI424201	1.5	1.5	.	.	1.5	1.5
25	PI437640A	2.0	1.5	.	.	1.8	1.8
26	PI437697	3.5	3.0	.	.	2.3	2.9
27	PI437863A	3.0	1.5	.	.	2.0	2.2
28	PI438085	3.5	2.0	.	.	1.8	2.4
29	PI503338	3.0	1.5	.	.	1.8	2.1
LSMean		2.7	1.6	.	.	2.0	2.1

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ This trait was not recorded at this location in 1998.

Table 22. Mottling score (1= good, 5=poor) of soybean accessions in SAGE Test 2 (primarily maturity group II) evaluated in 1998. Means are presented as LSMeans from the GLM procedure of SAS ¹⁾.

Code	Name	Ames, IA	Cedar Falls, IA ²⁾	Janesville, WI ²⁾	Johnston, IA ²⁾	Urbana, IL ²⁾	LSMean
1	9254	2.0	.	.	.	.	2.0
2	IA2021	2.0	.	.	.	.	2.0
3	Savoy	2.0	.	.	.	.	2.0
4	PI593959	1.5	.	.	.	.	1.5
5	PI594304A	2.0	.	.	.	.	2.0
6	PI068508	1.0	.	.	.	.	1.0
7	PI068600	1.5	.	.	.	.	1.5
8	PI068658	1.5	.	.	.	.	1.5
9	PI070463	1.5	.	.	.	.	1.5
10	PI088798	1.5	.	.	.	.	1.5
11	PI091091	1.5	.	.	.	.	1.5
12	PI091167	1.0	.	.	.	.	1.0
13	PI189930	2.0	.	.	.	.	2.0
14	PI227333	2.0	.	.	.	.	2.0
15	PI253653D	1.5	.	.	.	.	1.5
16	PI261474	2.0	.	.	.	.	2.0
17	PI290126B	1.5	.	.	.	.	1.5
18	PI297505	2.0	.	.	.	.	2.0
19	PI297515	1.5	.	.	.	.	1.5
20	PI297544	1.5	.	.	.	.	1.5
21	PI361064	3.0	.	.	.	.	3.0
22	PI383277	2.0	.	.	.	.	2.0
23	PI407720	1.5	.	.	.	.	1.5
24	PI424201	1.0	.	.	.	.	1.0
25	PI437640A	2.5	.	.	.	.	2.5
26	PI437697	4.0	.	.	.	.	4.0
27	PI437863A	1.5	.	.	.	.	1.5
28	PI438085	1.5	.	.	.	.	1.5
29	PI503338	2.0	.	.	.	.	2.0
LSMean		1.8	.	.	.	.	1.8

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ This trait was not recorded at this location in 1998.

TEST 3

(Primarily maturity group III and IV)

SUMMARY ACROSS LOCATIONS IN 1998

Table 23. Morphological characteristics and origin of accessions in SAGE Test 3 (primarily maturity groups III and IV) evaluated in 1998.

Code	PI Number	Accession Name	Origin	Flower Color ¹⁾	Pubescence Color ²⁾	Stem Termin. ³⁾	Podwall Color ⁴⁾	Hilum Color ⁵⁾	Seed Coat Color ⁶⁾	Maturity Group ⁷⁾
6	PI574477	Fen dou No. 31	China	W	T	N	Br	Br	Y	IV
7	PI592936	Ji dou No. 7	China	P	G	D	Tn	Y	Y	II
8	PI592946	Ji dou No. 4	China	P	T	N	Br	Br-Ib	Y	IV
9	PI592947	Jin yi No. 9	China	P	G	D	Br	Ib	Y	IV
10	FC004007B		Unknown	P	T	N	Br	Y	Y	III
11	FC029333	Laredo	Unknown	W	G	N	Br	Bf	Y	III
12	PI068560		China	W	G	N	Dbr	Y	Y	III
13	PI086114	Hoten Kuroheso	Japan	W	T	N	Br	Bl	Y	III
14	PI086456	Kakukwazoshi	Japan	W	G	N	Dbr	Lbf	Y	III
15	PI088306		China	W	G	D	Br	Lbf	Y	III
16	PI088310		China	W	G	D	Br	Lbf	Y	III
17	PI088350	Kaiyuan	China	W	G	N	Dbr	Y	Y	III
18	PI088447		China	P	G	N	Br	Y	Y	III
19	PI090566-1		China	W	G	N	Tn	Bf	Y	III
20	PI091113		China	W	G	N	Dbr	Bf	Y	III
21	PI091142		China	W	G	N	Br	Lbf	Y	III
22	PI091730-1		China	W	G	N	Br	Y	Y	III
23	PI153309	Bergerac	France	W	G	N	Br	Bf	Y	III
24	PI227328	Manchikin	Japan	W	G	N	Br	Lbf	Y	III
25	PI248402	Manhattan	United States	P	G	N	Br	Ib	Y	IV
26	PI253665D		China	W	G	N	Br	Lbf	Y	III
27	PI283331	No. 380	Morocco	P	T	N	Br	Y	Y	III
28	PI398881		Korea, South	P	T	N	Br	Bl	Y	III
29	PI404161	Mocinabe 7	Georgia	W	G	N	Tn	Bf	Y	IV
30	PI415074	Tie feng 19A	China	W	G	N	Tn	Y	Y	III
31	PI424405B		Korea, South	P	T	N	Br	Bl	Y	IV
32	PI507295	Shoutou 1 (Chou)	Japan	W	G	D	Br	Lbf	Y	III

¹⁾ P= Purple, W= White, Dp= Dark purple.

²⁾ G= Gray, T= Tawny.

³⁾ D= Determinate, N= Indeterminate.

⁴⁾ Br= Brown, Tn= Tan, Dbr= Dark Brown.

⁵⁾ Y= Yellow, Bf= Buff, Lbf= Light buff, Ib= Imperfect Black, Br= Brown, Br-Ib = Brown to Imperfect Black.

⁶⁾ Y= Yellow, Lgmr= Light green.

⁷⁾ Maturity group assigned by USDA Soybean Germplasm Collection.

Table 24. Overall agronomic performance of Asian soybean varieties in the SAGE Test 3 (primarily maturity groups III and IV) evaluated in 1998. Means are presented as LSMeans from the GLM procedure of SAS ¹⁾.

Code	PI Number	Yield (bu/a) ²⁾	Maturity (Sept 1=1)	Plant Height (in)	Lodging (1 to 5) ³⁾	100-Seed Weight (g)	Seed Quality (1 to 5) ³⁾	Shattering (0 to 9) ⁴⁾	Mottling (1 to 5) ³⁾
1	9352	49.7	23	30	1.5	12.5	.	0.0	.
2	9421	54.4	27	36	1.8	14.5	.	0.0	.
3	Cisne	53.1	27	34	2.1	18.0	.	0.0	.
4	Iroquois	48.3	20	33	1.8	14.5	.	0.0	.
5	Macon	51.9	24	31	1.8	14.7	.	0.0	.
6	PI574477	36.8	25	37	3.0	12.4	.	0.0	.
7	PI592936	40.7	15	29	1.9	17.6	.	1.5	.
8	PI592946	38.7	23	29	1.6	16.6	.	0.0	.
9	PI592947	41.6	28	33	2.9	16.0	.	0.0	.
10	FC004007B	30.9	17	27	2.6	11.9	.	0.0	.
11	FC029333	37.8	17	37	3.1	14.3	.	0.0	.
12	PI068560	38.5	16	35	2.3	19.8	.	1.0	.
13	PI086114	27.4	18	31	2.8	14.8	.	1.0	.
14	PI086456	35.2	16	32	2.0	20.4	.	1.0	.
15	PI088306	39.5	19	24	2.4	24.6	.	0.0	.
16	PI088310	41.5	16	27	2.3	22.1	.	0.0	.
17	PI088350	35.1	15	32	2.5	18.4	.	1.0	.
18	PI088447	37.2	19	36	3.6	16.6	.	1.0	.
19	PI090566-1	33.3	13	27	2.3	14.2	.	0.5	.
20	PI091113	41.2	16	35	2.9	15.5	.	0.0	.
21	PI091142	42.8	19	34	2.9	15.5	.	1.0	.
22	PI091730-1	35.2	19	35	3.7	13.0	.	1.0	.
23	PI153309	35.9	15	38	3.5	12.9	.	0.0	.
24	PI227328	44.8	16	33	2.9	16.0	.	3.0	.
25	PI248402	38.3	26	34	1.9	17.0	.	0.0	.
26	PI253665D	43.5	15	30	2.1	19.3	.	0.0	.
27	PI283331	35.4	22	39	2.9	13.0	.	0.0	.
28	PI398881	38.8	16	33	2.6	14.7	.	0.0	.
29	PI404161	37.6	28	34	3.6	14.0	.	0.0	.
30	PI415074	40.9	16	32	2.5	17.2	.	0.5	.
31	PI424405B	37.3	27	37	2.6	12.7	.	0.0	.
32	PI507295	45.4	20	25	2.4	12.9	.	0.0	.

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 5 edition. Cary, NC. 956 pp.

²⁾ Four locations were used in calculating the yield LSMeans, see individual location tables for the rest of the traits.

³⁾ 1=best, 5=worst.

⁴⁾ 0=none, 9=80-90% shattering. Shattering occurred after harvest and thus, did not affect yield results.

Table 25. Seed protein, oil and fatty acid analysis of exotic soybean varieties in the SAGE Test 3 (primarily maturity group III and IV) evaluated in 1998. Individual values are the average of 3 locations (one replication per location) and reported as LSMeans from the GLM procedure of SAS ¹⁾.

CODE	Entry	Oil	Pro	Fatty Acid Composition ²⁾					Total Sats. ³⁾
				16:0	18:0	18:1	18:2	18:3	
				%					
1	P9352	21.6	41.1	10.1	4.1	27.7	52.0	6.0	14.3
2	P9421	21.6	41.6	10.5	4.2	27.0	52.2	6.0	14.7
3	CISNE	20.6	44.5	10.8	5.2	27.0	50.4	6.6	15.9
4	IROQUOIS	20.9	41.7	11.3	4.2	26.4	52.3	5.7	15.5
5	MACON	21.4	41.7	10.8	4.1	26.4	52.0	6.6	14.9
6	I574477	20.1	43.7	10.2	4.3	25.2	54.0	6.5	14.4
7	I592936	19.8	43.8	10.8	3.8	33.3	46.0	5.9	14.6
8	I592946	20.9	43.9	11.1	4.8	24.7	52.9	6.5	15.9
9	I592947	19.6	41.7	11.0	4.9	26.7	51.5	5.9	15.9
10	FC004007B	19.6	44.1	10.3	4.1	26.7	52.1	6.8	14.4
11	FC029333	19.6	43.1	10.6	4.0	25.4	53.1	7.0	14.5
12	I068560	22.3	42.9	9.8	4.0	31.1	49.4	5.7	13.8
13	I086114	19.0	43.3	9.7	4.6	34.3	45.0	6.3	14.3
14	I086456	21.5	43.1	9.6	4.1	32.3	48.3	5.7	13.7
15	I088306	20.1	43.4	11.5	4.3	28.4	49.1	6.7	15.8
16	I088310	20.5	43.3	11.7	4.1	26.1	51.0	7.0	15.8
17	I088350	21.7	43.1	9.8	3.9	30.8	49.7	5.8	13.7
18	I088447	19.2	42.7	10.6	4.3	25.7	52.1	7.4	14.9
19	I090566-1	21.5	41.1	11.0	4.3	26.8	51.8	6.1	15.4
20	I091113	20.0	41.7	10.8	3.7	33.7	46.2	5.5	14.5
21	I091142	19.6	42.1	10.3	4.2	26.5	52.2	6.9	14.4
22	I091730-1	18.4	44.9	11.1	3.9	25.5	52.3	7.3	15.0
23	I153309	20.2	42.6	10.8	4.1	24.3	53.5	7.3	14.9
24	I227328	18.9	44.9	11.4	3.4	28.2	50.4	6.6	14.8
25	I248402	20.8	43.9	10.7	5.1	28.0	50.2	6.0	15.8
26	I253665D	20.2	44.8	11.0	4.4	32.2	46.7	5.7	15.4
27	I283331	19.1	44.2	10.6	3.9	28.8	50.6	6.1	14.5
28	I398881	20.2	43.5	10.7	4.7	24.3	53.4	6.9	15.3
29	I404161	18.3	42.6	10.7	4.8	32.2	46.2	6.1	15.5
30	I415074	19.1	43.3	10.0	4.3	27.6	52.2	6.0	14.3
31	I424405B	19.9	42.7	10.5	5.0	23.4	54.6	6.6	15.5
32	I507295	20.6	42.0	11.5	4.3	27.7	49.7	6.8	15.8
LSMEAN		20.2	43.0	10.7	4.3	27.9	50.7	6.4	14.9

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ 16:0=Palmitic acid; 18:0=Stearic acid; 18:1=Oleic acid; 18:2=Linoleic acid; 18:3=Linolenic acid.

³⁾ Total of saturated fatty acids (16:0 + 18:0).

TEST 3

(Primarily maturity group III and IV)

INDIVIDUAL LOCATIONS IN 1998

Table 26. Yield (bu/a) of soybean accessions in SAGE Test 3 (primarily maturity groups III and IV) evaluated in 1998. Means are presented as LSMeans from the GLM procedure of SAS ¹⁾.

Code	Name	Oxford, IN	Queenstown, MD	St. Joseph, IL ²⁾	Stonnington, IL	LSMean
1	9352	57.9	31.0	39.5	70.6	49.7
2	9421	57.9	40.5	50.1	69.1	54.4
3	Cisne	61.8	39.8	46.7	64.0	53.1
4	Iroquois	55.9	36.6	45.8	54.9	48.3
5	Macon	53.8	35.7	49.7	68.6	51.9
6	PI574477	43.2	30.0	30.4	43.6	36.8
7	PI592936	47.2	25.1	42.1	48.3	40.7
8	PI592946	48.1	29.3	30.2	47.3	38.7
9	PI592947	41.4	31.0	40.2	53.7	41.6
10	FC004007B	38.7	24.1	17.6	43.3	30.9
11	FC029333	34.9	31.4	39.1	45.9	37.8
12	PI068560	41.0	30.0	38.3	44.8	38.5
13	PI086114	29.9	23.0	20.2	36.4	27.4
14	PI086456	40.1	27.1	31.3	42.5	35.2
15	PI088306	42.6	32.1	33.3	50.2	39.5
16	PI088310	46.7	30.1	39.4	50.0	41.5
17	PI088350	43.0	29.0	25.4	43.0	35.1
18	PI088447	40.4	32.8	30.4	45.1	37.2
19	PI090566-1	39.2	24.9	21.6	47.7	33.3
20	PI091113	45.7	32.0	39.6	47.4	41.2
21	PI091142	46.6	28.9	44.1	51.8	42.8
22	PI091730-1	36.2	23.4	37.5	43.7	35.2
23	PI153309	33.6	23.9	39.2	46.8	35.9
24	PI227328	40.7	.	43.2	50.6	44.8
25	PI248402	43.0	25.5	28.9	56.1	38.3
26	PI253665D	47.3	24.7	44.4	57.5	43.5
27	PI283331	41.2	23.9	35.6	40.9	35.4
28	PI398881	46.8	28.6	31.6	48.2	38.8
29	PI404161	40.2	29.1	32.9	48.3	37.6
30	PI415074	44.9	32.4	42.1	44.4	40.9
31	PI424405B	46.8	25.6	30.7	46.1	37.3
32	PI507295	50.2	38.0	40.5	52.9	45.4
LSMean		44.6	29.6	36.3	50.1	41.2
LSD(0.05) ³⁾		7.8	8.2	.	7.5	4.1
CV (%)		9	14	.	7	9

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ Only 1 rep was harvested at this site.

³⁾ A single LSD value is given for each location although LSMeans are presented. The average LSD's values closely approximate the individual pairwise LSD's obtained from the LSMean provided by SAS.

Table 27. Maturity Date (September 1 = 1) of soybean accessions in SAGE Test 3 (primarily maturity groups III and IV) evaluated in 1998. Means are presented as LSMeans from the GLM procedure of SAS ¹⁾.

Code	Name	Oxford, IN	Queenstown, MD	St. Joseph, IL ²⁾	Stonnington, IL	LSMean
1	9352	29	22	19	22	23
2	9421	30	26	24	26	27
3	Cisne	30	25	25	27	27
4	Iroquois	25	20	15	19	20
5	Macon	28	24	19	25	24
6	PI574477	29	24	24	22	25
7	PI592936	20	15	12	15	15
8	PI592946	27	26	19	22	23
9	PI592947	31	27	25	29	28
10	FC004007B	21	22	13	13	17
11	FC029333	18	22	13	15	17
12	PI068560	20	20	12	11	16
13	PI086114	20	23	14	16	18
14	PI086456	20	23	11	11	16
15	PI088306	24	23	14	14	19
16	PI088310	21	18	13	12	16
17	PI088350	20	17	11	11	15
18	PI088447	26	21	15	14	19
19	PI090566-1	18	15	9	12	13
20	PI091113	20	18	12	12	16
21	PI091142	25	22	15	16	19
22	PI091730-1	24	17	18	19	19
23	PI153309	19	15	12	15	15
24	PI227328	20	16	13	15	16
25	PI248402	31	24	23	28	26
26	PI253665D	19	17	12	14	15
27	PI283331	27	21	19	20	22
28	PI398881	20	16	14	14	16
29	PI404161	32	23	28	31	28
30	PI415074	20	16	13	14	16
31	PI424405B	30	25	25	26	27
32	PI507295	28	17	17	19	20
LSMean		24	21	17	18	20

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ Only 1 rep was harvested at this site.

Table 28. Plant Height (inches) of soybean accessions in SAGE Test 3 (primarily maturity groups III and IV) evaluated in 1998. Means are presented as LSMeans from the GLM procedure of SAS ¹⁾.

Code	Name	Oxford, IN	Queenstown, MD	St. Joseph, IL ²⁾	Stonnington, IL	LSMean
1	9352	31	26	30	32	30
2	9421	39	34	37	35	36
3	Cisne	39	28	36	32	34
4	Iroquois	36	29	38	31	33
5	Macon	35	23	34	34	31
6	PI574477	37	31	42	37	37
7	PI592936	30	24	34	27	29
8	PI592946	37	24	27	28	29
9	PI592947	38	27	38	31	33
10	FC004007B	31	22	25	31	27
11	FC029333	40	32	38	38	37
12	PI068560	38	32	40	32	35
13	PI086114	34	31	27	33	31
14	PI086456	36	30	32	32	32
15	PI088306	27	23	23	25	24
16	PI088310	30	27	25	26	27
17	PI088350	37	32	26	34	32
18	PI088447	40	31	40	32	36
19	PI090566-1	32	24	26	28	27
20	PI091113	42	26	40	34	35
21	PI091142	35	31	36	34	34
22	PI091730-1	38	34	35	35	35
23	PI153309	43	31	42	38	38
24	PI227328	33	27	39	33	33
25	PI248402	34	27	37	38	34
26	PI253665D	32	24	36	29	30
27	PI283331	36	28	57	34	39
28	PI398881	37	31	32	32	33
29	PI404161	36	29	38	35	34
30	PI415074	36	25	37	29	32
31	PI424405B	40	32	38	37	37
32	PI507295	27	25	22	26	25
LSMean		35	28	35	32	32

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ Only 1 rep was harvested at this site.

Table 29. Plant Lodging score (1=erect, 5=prostrate) of soybean accessions in SAGE Test 3 (primarily maturity groups III and IV) evaluated in 1998. Means are presented as LSMeans from the GLM procedure of SAS ¹⁾.

Code	Name	Oxford, IN	Queenstown, MD	St. Joseph, IL ²⁾	Stonnington, IL	LSMean
1	9352	2.3	1.3	1.0	1.5	1.5
2	9421	3.0	1.8	1.0	1.5	1.8
3	Cisne	3.0	1.8	2.0	1.5	2.1
4	Iroquois	3.0	1.3	1.5	1.5	1.8
5	Macon	3.0	1.3	1.5	1.5	1.8
6	PI574477	4.3	1.5	3.5	2.8	3.0
7	PI592936	2.5	1.3	2.0	1.8	1.9
8	PI592946	3.3	1.3	1.0	1.0	1.6
9	PI592947	4.3	1.5	3.5	2.5	2.9
10	FC004007B	4.5	1.5	1.5	3.0	2.6
11	FC029333	4.5	2.5	2.5	3.0	3.1
12	PI068560	2.5	2.0	2.0	2.5	2.3
13	PI086114	4.5	3.0	1.0	2.8	2.8
14	PI086456	3.3	1.5	1.0	2.3	2.0
15	PI088306	4.5	2.3	1.0	2.0	2.4
16	PI088310	4.3	2.5	1.0	1.5	2.3
17	PI088350	4.3	2.3	1.0	2.5	2.5
18	PI088447	5.0	2.8	3.5	3.0	3.6
19	PI090566-1	4.0	1.3	1.0	3.0	2.3
20	PI091113	4.8	1.5	3.0	2.3	2.9
21	PI091142	4.5	2.0	2.5	2.8	2.9
22	PI091730-1	5.0	2.8	4.0	3.0	3.7
23	PI153309	5.0	2.8	2.5	3.8	3.5
24	PI227328	4.8	2.0	2.0	2.8	2.9
25	PI248402	2.3	1.5	1.5	2.3	1.9
26	PI253665D	4.0	1.0	1.5	1.8	2.1
27	PI283331	4.3	1.8	3.5	2.3	2.9
28	PI398881	4.0	1.5	2.0	2.8	2.6
29	PI404161	5.0	1.3	4.0	4.0	3.6
30	PI415074	3.8	1.5	2.0	2.8	2.5
31	PI424405B	4.0	2.0	2.0	2.5	2.6
32	PI507295	3.8	2.2	1.0	2.5	2.4
LSMean		3.9	1.8	2.0	2.4	2.5

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ Only 1 rep was harvested at this site.

Table 30. Seed Weight (g/100 seed) of soybean accessions in SAGE Test 3 (primarily maturity groups III and IV) evaluated in 1998. Means are presented as LSMeans from the GLM procedure of SAS ¹⁾.

Code	Name	Oxford, IN ²⁾	Queenstown, MD	St. Joseph, IL ²⁾	Stonnington, IL ²⁾	LSMean
1	9352	.	12.5	.	.	12.5
2	9421	.	14.5	.	.	14.5
3	Cisne	.	18.0	.	.	18.0
4	Iroquois	.	14.5	.	.	14.5
5	Macon	.	14.7	.	.	14.7
6	PI574477	.	12.4	.	.	12.4
7	PI592936	.	17.6	.	.	17.6
8	PI592946	.	16.6	.	.	16.6
9	PI592947	.	16.0	.	.	16.0
10	FC004007B	.	11.9	.	.	11.9
11	FC029333	.	14.3	.	.	14.3
12	PI068560	.	19.8	.	.	19.8
13	PI086114	.	14.8	.	.	14.8
14	PI086456	.	20.4	.	.	20.4
15	PI088306	.	24.6	.	.	24.6
16	PI088310	.	22.1	.	.	22.1
17	PI088350	.	18.4	.	.	18.4
18	PI088447	.	16.5	.	.	16.6
19	PI090566-1	.	14.2	.	.	14.2
20	PI091113	.	15.5	.	.	15.5
21	PI091142	.	15.5	.	.	15.5
22	PI091730-1	.	13.0	.	.	13.0
23	PI153309	.	12.9	.	.	12.9
24	PI227328	.	16.0	.	.	16.0
25	PI248402	.	17.0	.	.	17.0
26	PI253665D	.	19.3	.	.	19.3
27	PI283331	.	13.0	.	.	13.0
28	PI398881	.	14.7	.	.	14.7
29	PI404161	.	14.0	.	.	14.0
30	PI415074	.	17.2	.	.	17.2
31	PI424405B	.	12.7	.	.	12.7
32	PI507295	.	12.9	.	.	12.9
LSMean		.	15.8	.	.	15.8

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

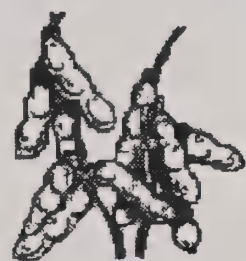
²⁾ This trait was not recorded at this location in 1998.

Table 31. Shattering score (0= none, 9=81-90% of pods shattered) seed) of soybean accessions in SAGE Test 3 (primarily maturity groups III and IV) evaluated in 1998. Means are presented as LSMeans from the GLM procedure of SAS ¹⁾. Shattering occurred after harvest and did not affect yield.

Code	Name	Oxford, IN ²⁾	Queenstown, MD	St. Joseph, IL ²⁾	Stonnington, IL ²⁾	LSMean
1	9352	.	0.0	.	.	0.0
2	9421	.	0.0	.	.	0.0
3	Cisne	.	0.0	.	.	0.0
4	Iroquois	.	0.0	.	.	0.0
5	Macon	.	0.0	.	.	0.0
6	PI574477	.	0.0	.	.	1.5
7	PI592936	.	1.5	.	.	0.0
8	PI592946	.	0.0	.	.	0.0
9	PI592947	.	0.0	.	.	0.0
10	FC004007B	.	0.0	.	.	0.0
11	FC029333	.	0.0	.	.	1.0
12	PI068560	.	1.0	.	.	1.0
13	PI086114	.	1.0	.	.	1.0
14	PI086456	.	1.0	.	.	0.0
15	PI088306	.	0.0	.	.	0.0
16	PI088310	.	0.0	.	.	1.0
17	PI088350	.	1.0	.	.	1.0
18	PI088447	.	1.0	.	.	0.5
19	PI090566-1	.	0.5	.	.	0.0
20	PI091113	.	0.0	.	.	1.0
21	PI091142	.	1.0	.	.	1.0
22	PI091730-1	.	1.0	.	.	0.0
23	PI153309	.	0.0	.	.	3.0
24	PI227328	.	3.0	.	.	0.0
25	PI248402	.	0.0	.	.	0.0
26	PI253665D	.	0.0	.	.	0.0
27	PI283331	.	0.0	.	.	0.0
28	PI398881	.	0.0	.	.	0.0
29	PI404161	.	0.0	.	.	0.5
30	PI415074	.	0.5	.	.	0.0
31	PI424405B	.	0.0	.	.	0.0
32	PI507295	.	0.0	.	.	0.0
LSMean		.	0.4	.	.	0.4

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ This trait was not recorded at this location in 1998.



TEST 5

(Primarily maturity group IV and V)

SUMMARY ACROSS LOCATIONS IN 1998

Table 32. Morphological characteristics and origin of accessions in SAGE Test 5 (primarily maturity groups IV and V) evaluated in 1998.

Code	PI Number	Accession Name	Origin	Flower Color ¹⁾	Pubescence Color ²⁾	Stem Termin. ³⁾	Podwall Color ⁴⁾	Hilum Color ⁵⁾	Seed Coat Color ⁶⁾	Maturity Group ⁷⁾
6	PI423897	Tamahikari	Japan	W	G	D	Br	Y	Y	V
7	PI423912	Misuzu Daizu	Japan	W	G	D	Br	Bf	Y	V
8	PI561388	Nakasennari	Japan	P	G	D	Br	Y	Y	V
9	PI398434		Korea, South	P	G	D	Tn	Bf	Y	V
10	PI398580		Korea, South	P	G	D	Tn	Y	Y	VI
11	PI398610		Korea, South	P	G	D	Tn	Br	Y	V
12	PI398612		Korea, South	P	G	D	Tn	Br	Y	V
13	PI398833		Korea, South	P	G	D	Tn	Bf	Y	V
14	PI398976		Korea, South	P	G	D	Tn	Bf	Y	V
15	PI399044		Korea, South	W	T	D	Tn	Br	Y	V
16	PI399045		Korea, South	W	T	D	Tn	Br	Y	V
17	PI399122		Korea, South	P	T	D	Tn	Bl	Y	V
18	PI407837		Korea, South	W	G	D	Tn	Br	Y	V
19	PI407910		Korea, South	P	G	D	Tn	Br	Y	V
20	PI407911		Korea, South	P	G	D	Tn	Br	Y	V
21	PI407975B		Korea, South	W	G	D	Tn	Bf	Y	V
22	PI407993		Korea, South	P	T	D	Br	Br	Br	V
23	PI407994		Korea, South	W	G	D	Tn	Bf	Y	V
24	PI408037		Korea, South	P	G	D	Br	Bf	Gn	V
25	PI408040-2		Korea, South	W	T	D	Br	Br	Y	V
26	PI408041		Korea, South	P	G	D	Br	Bf	Gn	V
27	PI408219		Korea, South	W	G	D	Br	Br	Y	V
28	PI408250		Korea, South	P	G	D	Tn	Bf	Y	V
29	PI408337		Korea, South	W	T	D	Tn	Br	Y	V
30	PI408339		Korea, South	W	T	D	Tn	Br	Y	V
31	PI417331	Shiro Pankon	Japan	P	T	D	Br	Bf	Y	V
32	PI423759		Korea, South	P	G	D	Tn	Bf	Y	V
33	PI423773		Korea, South	W	G	N	Br	Br	Gn	V
34	PI423900	Aisa	Japan	P	G	D	Tn	Bf	Y	VI
35	PI424178B		Korea, South	P	T	D	Br	Br	Gn	V
36	PI424415		Korea, South	P	G	D	Br	Bl	Gn	V

Table 32 Continued. Morphological characteristics and origin of accessions in SAGE Test 5 (primarily maturity groups IV and V) evaluated in 1998.

37	PI458073		Korea, South	P	T	D	Br	Br	Gn	V
38	PI471931		Nepal	W	G	D	Br	Bf	Y	V
39	PI471938		Nepal	P	G	N	Tn	Y	Y	V
40	PI506651	Dai-ichi Hienuki 10-3	Japan	P	T	D	Br	Bf	Gn	V
41	PI506660	Date Ao	Japan	W	T	D	Br	Br	Gn	V
42	PI507079	Nakasennari	Japan	P	G	D	Br	Y	Y	V
43	PI507098	Nitchuu 47	Japan	P	G	D	Tn	G	Y	V
44	PI507269	Shiro Mitsu Mame	Japan	P	G	D	Br	Bf	Y	V
45	PI507369	Touhoku 53	Japan	P	G	D	Br	Y	Y	IV
46	PI508294		Korea, South	P	G	D	Tn	Br	Y	V
47	PI509098		Korea, South	P	G	D	Tn	Y	Y	V
48	PI509106		Korea, South	P	T	D	Br	Bl	Gn	V

¹⁾ P= Purple, W= White, Dp= Dark purple.

²⁾ G= Gray, T= Tawny.

³⁾ D= Determinate, N= Indeterminate.

⁴⁾ Br= Brown, Tn= Tan, Dbr= Dark Brown.

⁵⁾ Y= Yellow, Bf= Buff, Lbf= Light buff, lbf= Imperfect Black, Br= Brown.

⁶⁾ Y= Yellow, Lgnr= Light green, Gn = Green.

⁷⁾ Maturity group assigned by USDA Soybean Germplasm Collection.

Table 33. Overall agronomic performance of Asian soybean varieties in the SAGE Test 5 (primarily maturity group V) evaluated in 1998. Means are presented as LSMeans from the GLM procedure of SAS¹⁾. Two sites, Kinston, NC and Stuttgart, AR, were not included in these means due to high LSD's.

Code	PI Number	Yield (bu/a) ²⁾	Maturity (Sept 1=1)	Plant Height (in)	Lodging (1 to 5) ³⁾	Shattering (0 to 9) ⁴⁾
1	Manokin	44.1	31	26	2.1	1.0
2	9594	52.5	38	28	2.1	1.5
3	Graham	48.8	35	26	1.9	1.5
4	Hutcheson	48.7	35	27	1.8	1.3
5	Dillon	47.1	42	30	2.4	1.5
6	PI423897	29.9	34	25	2.3	3.3
7	PI423912	37.6	36	21	1.6	2.5
8	PI561388	34.0	32	25	1.6	2.3
9	PI398434	34.0	36	25	3.0	1.0
10	PI398580	33.9	34	31	3.0	1.0
11	PI398610	32.5	35	24	2.3	2.0
12	PI398612	32.5	35	29	2.4	1.2
13	PI398833	40.8	30	21	3.3	1.8
14	PI398976	38.7	32	22	2.5	1.5
15	PI399044	38.6	26	27	2.8	1.3
16	PI399045	34.2	25	26	1.9	1.0
17	PI399122	30.7	38	29	2.6	1.5
18	PI407837	29.8	36	25	2.1	1.8
19	PI407910	34.2	37	26	2.1	1.5
20	PI407911	32.5	36	27	2.6	1.5
21	PI407975B	36.0	31	15	2.1	1.7
22	PI407993	27.9	39	24	2.8	1.0
23	PI407994	33.7	32	20	2.4	1.5
24	PI408037	28.8	37	28	2.1	1.5
25	PI408040-2	37.5	34	29	2.9	2.0
26	PI408041	34.2	38	27	2.2	1.5
27	PI408219	34.1	36	27	2.2	2.0
28	PI408250	38.8	29	22	2.9	1.5
29	PI408337	37.6	26	26	2.1	1.3
30	PI408339	36.7	23	26	2.1	1.0
31	PI417331	35.0	32	24	2.3	1.8
32	PI423759	35.4	39	25	2.8	1.5
33	PI423773	28.6	35	38	3.1	1.5
34	PI423900	35.8	36	32	2.6	1.0
35	PI424178B	25.9	33	24	2.3	1.7
36	PI424415	29.4	39	26	2.8	1.8
37	PI458073	27.7	36	28	2.0	2.3
38	PI471931	41.9	32	26	2.4	1.3
39	PI471938	37.4	39	27	2.1	1.0
40	PI506651	27.5	30	26	2.6	4.0
41	PI506660	35.5	34	21	2.0	2.3
42	PI507079	32.6	30	23	2.0	2.0
43	PI507098	32.3	28	28	2.7	1.8
44	PI507269	30.7	39	29	3.0	2.5
45	PI507369	25.7	29	21	2.3	2.5
46	PI508294	37.2	27	27	3.3	1.5
47	PI509098	39.9	31	22	2.3	1.8
48	PI509106	34.1	34	24	2.5	2.0

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 5 edition. Cary, NC. 956 pp.

²⁾ Three locations were used in calculating the yield LSMeans, see individual location tables for the rest of the traits.

³⁾ 1=best, 5=worst.

⁴⁾ 0=none; 9=80-90% shattering. Shattering occurred after harvest and thus, did not affect yield results.

Table 6. Seed protein, oil and fatty acid analysis of exotic soybean varieties in the SAGE Test 5 (primarily maturity group IV and V) evaluated in 1998. Individual values are the average of 3 locations (one replication per location) and reported as LSMeans from the GLM procedure of SAS ¹⁾.

CODE	Entry	Oil	Pro	Fatty Acid Composition ²⁾					Total Sats. ³⁾
				16:0	18:0	18:1	18:2	18:3	
				%					
1	MANOKIN	22.3	41.3	11.5	4.7	25.7	52.5	5.6	16.2
2	P9594	21.3	41.9	11.5	3.3	23.4	55.7	6.0	14.8
3	GRAHAM	22.6	41.1	11.0	4.1	22.3	56.1	6.6	15.1
4	HUTCH	22.1	41.7	10.9	4.1	23.0	55.5	6.4	15.0
5	DILLON	21.2	42.5	10.1	3.3	25.9	54.8	5.8	13.4
6	PI423897	19.5	43.6	10.8	3.4	26.2	53.3	6.2	14.2
7	PI423912	19.7	43.8	10.8	3.3	29.0	50.5	6.4	14.0
8	PI561388	20.4	42.0	11.3	3.4	24.9	54.5	5.9	14.7
9	PI398434	14.4	45.0	11.0	4.0	21.8	56.8	6.3	15.1
10	PI398580	17.8	45.7	12.2	3.6	24.0	53.8	6.4	15.8
11	PI398610	13.3	49.5	12.2	3.7	22.0	54.0	8.0	15.9
12	PI398612	13.0	48.2	11.2	4.0	21.5	55.3	8.0	15.1
13	PI398833	18.4	44.7	11.6	3.7	24.8	54.4	5.5	15.3
14	PI398976	18.9	43.2	11.7	3.8	23.2	55.0	6.3	15.5
15	PI399044	21.7	41.8	11.4	3.4	26.5	52.9	5.7	14.8
16	PI399045	21.5	41.8	11.5	3.7	26.0	52.8	5.9	15.2
17	PI399122	13.3	48.5	11.2	4.1	23.0	54.2	7.5	15.3
18	PI407837	18.2	43.8	10.7	4.2	23.5	54.7	6.9	15.0
19	PI407910	20.1	42.2	11.0	4.1	23.3	55.3	6.2	15.1
20	PI407911	19.7	42.9	11.2	4.3	24.0	54.5	5.8	15.5
21	PI407975B	18.2	45.3	11.1	3.6	22.1	55.9	7.3	14.8
22	PI407993	.	.	9.3	3.8	21.9	57.9	7.1	13.1
23	PI407994	18.5	44.7	11.8	3.6	22.7	55.1	6.8	15.4
24	PI408037	21.3	42.1	10.3	3.6	23.7	56.3	6.2	13.8
25	PI408040-2	19.9	46.1	11.1	3.5	23.9	55.1	6.3	14.6
26	PI408041	20.9	43.0	10.5	3.6	21.8	56.8	7.3	14.1
27	PI408219	19.6	44.5	11.2	3.7	25.5	53.1	6.4	14.9
28	PI408250	18.0	44.5	11.7	3.7	24.6	54.4	5.7	15.3
29	PI408337	22.3	41.2	11.5	3.4	25.7	53.5	5.9	14.8
30	PI408339	22.0	41.2	11.5	3.5	25.9	53.1	5.9	15.0
31	PI417331	21.2	44.5	11.4	3.8	24.4	54.9	5.5	15.2
32	PI423759	17.6	43.8	11.3	4.1	19.9	57.9	6.9	15.3
33	PI423773	20.3	42.3	10.5	4.1	31.1	48.5	5.7	14.6
34	PI423900	16.3	45.5	11.0	3.3	24.6	53.9	7.2	14.3
35	PI424178B	20.2	41.4	11.2	4.0	25.0	53.7	6.2	15.2
36	PI424415	20.9	44.9	11.3	3.4	23.2	55.2	6.9	14.7
37	PI458073	21.2	42.0	11.2	3.5	25.7	53.5	6.1	14.7
38	PI471931	24.2	40.4	11.1	3.5	22.8	56.4	6.1	14.6
39	PI471938	22.6	41.3	10.8	4.3	23.7	55.4	5.9	15.1
40	PI506651	19.7	44.4	11.2	3.4	22.9	56.2	6.3	14.6

Table 6 Continued. Protein, oil and fatty acid analysis of exotic soybean varieties for SAGE Test 5.

41	PI506660	20.5	42.7	11.4	3.4	22.4	56.0	6.7	14.8
42	PI507079	20.4	42.1	11.8	3.6	23.2	54.8	6.5	15.4
43	PI507098	21.1	44.1	11.6	4.7	29.2	49.5	5.0	16.3
44	PI507269	19.0	45.7	11.6	4.0	24.1	53.6	6.7	15.5
45	PI507369	20.5	42.1	11.3	3.7	24.8	53.6	6.5	15.0
46	PI508294	17.9	44.8	12.5	3.7	22.3	54.4	7.0	16.2
47	PI509098	18.6	44.8	11.4	3.7	24.3	54.9	5.8	15.1
48	PI509106	21.5	40.5	9.9	3.6	23.1	56.8	6.6	13.5
LSMEAN		19.9	43.4	11.2	3.7	24.2	54.5	6.3	14.9

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ 16:0=Palmitic acid; 18:0=Stearic acid; 18:1=Oleic acid; 18:2=Linoleic acid; 18:3=Linolenic acid.

³⁾ Total of saturated fatty acids (16:0 + 18:0).

TEST 5

(Primarily maturity group IV and V)

INDIVIDUAL LOCATIONS IN 1998

Table 35. Yield (bu/a) of soybean accessions in SAGE Test 5 (primarily maturity groups IV and V) evaluated in 1998. Means are presented as LSMeans from the GLM procedure of SAS ¹⁾.

Code	Name	Galeena, MD	Greenville, MS	Keiser, AR	Kinston, NC ²⁾	Stuttgart, AR ²⁾	LSMean
1	Manokin	45.0	47.0	40.4	18.0	30.8	44.1
2	9594	46.5	64.1	47.1	50.6	44.0	52.5
3	Graham	51.5	52.3	42.6	50.8	33.3	48.8
4	Hutcheson	52.7	48.9	44.5	44.8	33.7	48.7
5	Dillon	39.1	51.8	50.4	46.0	53.9	47.1
6	PI423897	30.8	37.5	21.4	10.9	21.3	29.9
7	PI423912	43.0	32.7	36.9	17.5	17.8	37.6
8	PI561388	41.5	35.2	25.3	10.7	21.9	34.0
9	PI398434	33.6	35.1	33.2	29.1	28.9	34.0
10	PI398580	36.2	38.0	27.4	29.9	41.3	33.9
11	PI398610	31.7	31.3	34.4	19.6	26.8	32.5
12	PI398612	28.3	33.2	36.0	26.8	23.2	32.5
13	PI398833	42.2	45.1	35.3	14.2	31.9	41.0
14	PI398976	37.1	38.9	40.1	19.1	12.7	39.0
15	PI399044	38.1	38.5	39.2	15.0	23.8	39.0
16	PI399045	35.0	39.9	27.8	15.1	25.3	34.2
17	PI399122	26.7	35.1	30.2	31.3	24.0	30.7
18	PI407837	28.4	32.8	28.3	16.7	28.6	29.8
19	PI407910	32.5	39.0	31.1	27.1	26.9	34.2
20	PI407911	34.6	32.3	30.7	16.2	44.0	32.5
21	PI407975B	46.1	29.5	32.4	8.2	16.6	36.0
22	PI407993	32.2	23.3	28.3	21.8	30.8	27.9
23	PI407994	43.3	29.4	28.3	8.9	9.6	33.7
24	PI408037	33.5	28.0	25.0	18.5	13.7	28.8
25	PI408040-2	36.5	38.5	.	25.9	37.4	37.5
26	PI408041	30.9	25.2	46.6	27.2	33.1	34.2
27	PI408219	40.6	31.4	30.4	25.0	51.6	34.1
28	PI408250	42.6	38.0	35.8	11.3	33.1	39.0
29	PI408337	39.7	39.4	33.6	29.7	33.1	38.0
30	PI408339	37.6	42.7	29.8	19.1	29.6	37.0
31	PI417331	40.8	31.4	32.9	22.9	19.8	35.0
32	PI423759	34.0	36.1	36.2	32.1	37.8	35.4
33	PI423773	32.0	22.8	31.1	32.1	41.2	28.6
34	PI423900	39.5	38.9	28.9	31.5	45.3	35.8
35	PI424178B	35.6	19.5	22.7	22.4	31.8	25.9
36	PI424415	34.5	24.7	28.9	32.6	40.4	29.4
37	PI458073	32.0	28.5	22.5	20.2	56.0	27.7
38	PI471931	41.4	43.7	40.6	33.8	46.5	42.0
39	PI471938	37.7	43.2	31.2	31.9	44.5	37.4
40	PI506651	30.3	24.7	.	10.1	22.0	27.5
41	PI506660	32.6	29.5	44.3	16.6	32.9	35.5
42	PI507079	35.3	29.9	.	19.5	19.4	32.6
43	PI507098	36.8	27.6	32.4	9.2	23.8	32.3
44	PI507269	31.6	32.8	27.8	32.0	38.8	30.7
45	PI507369	32.2	24.7	20.1	11.1	0.8	25.7
46	PI508294	38.2	36.1	.	31.6	32.6	37.0
47	PI509098	39.6	38.9	41.1	12.6	33.7	40.0
48	PI509106	39.5	35.6	27.2	28.5	13.1	34.1
LSMean		37.1	35.5	33.2	23.6	30.5	35.4
LSD(0.05) ³⁾		8.0	8.3	10.0	20.9	24.5	4.8
CV (%)		11	12	14	40	39	12

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ This location is not included in overall lsmean due to high LSD value.

³⁾ A single LSD value is given for each location although LSMeans are presented. The average LSD's values closely approximate the individual pairwise LSD's obtained from the LSMean provided by SAS.

Table 36. Maturity Date (September 1 = 1) of soybean accessions in SAGE Test 5 (primarily maturity groups IV and V) evaluated in 1998. Means are presented as LSMeans from the GLM procedure of SAS ¹⁾.

Code	Name	Galeena, MD	Greenville, MS	Keiser, AR	Kinston, NC ²⁾	Stuttgart, AR ³⁾	LSMean
1	Manokin	33	21	39	32	.	31
2	9594	41	27	48	48	.	38
3	Graham	36	25	44	43	.	35
4	Hutcheson	38	25	42	44	.	35
5	Dillon	43	36	48	50	.	42
6	PI423897	35	27	40	39	.	34
7	PI423912	35	27	48	40	.	36
8	PI561388	34	22	41	37	.	32
9	PI398434	37	32	39	44	.	36
10	PI398580	39	32	31	44	.	34
11	PI398610	37	29	41	44	.	35
12	PI398612	39	29	38	45	.	35
13	PI398833	34	20	36	32	.	30
14	PI398976	34	18	44	31	.	32
15	PI399044	35	7	36	30	.	26
16	PI399045	33	6	37	30	.	25
17	PI399122	38	32	44	46	.	38
18	PI407837	36	29	43	42	.	36
19	PI407910	37	33	43	45	.	37
20	PI407911	37	31	41	44	.	36
21	PI407975B	34	22	39	33	.	31
22	PI407993	39	36	43	46	.	39
23	PI407994	35	24	39	33	.	32
24	PI408037	38	30	42	40	.	37
25	PI408040-2	37	32	.	45	.	34
26	PI408041	39	30	47	41	.	38
27	PI408219	36	30	42	45	.	36
28	PI408250	33	21	34	32	.	29
29	PI408337	34	7	37	29	.	26
30	PI408339	31	6	32	28	.	23
31	PI417331	35	26	37	41	.	32
32	PI423759	38	35	44	45	.	39
33	PI423773	38	30	37	45	.	35
34	PI423900	39	28	43	42	.	36
35	PI424178B	34	24	42	43	.	33
36	PI424415	38	36	43	47	.	39
37	PI458073	37	30	41	43	.	36
38	PI471931	34	23	40	39	.	32
39	PI471938	38	31	48	38	.	39
40	PI506651	32	28	.	34	.	30
41	PI506660	33	27	43	37	.	34
42	PI507079	35	25	.	37	.	30
43	PI507098	35	7	42	31	.	28
44	PI507269	38	36	44	45	.	39
45	PI507369	32	13	41	34	.	29
46	PI508294	33	20	.	40	.	27
47	PI509098	33	22	37	30	.	31
48	PI509106	36	25	40	44	.	34
LSMean		37	36	33	24	.	35

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ This location is not included in overall lsmean due to high LSD value.

³⁾ This trait was not recorded at this location in 1998.

Table 37. Plant Height (inches) of soybean accessions in SAGE Test 5 (primarily maturity groups IV and V) evaluated in 1998. Means are presented as LSMeans from the GLM procedure of SAS ¹⁾.

Code	Name	Galeena, MD	Greenville, MS	Keiser, AR	Kinston, NC ²⁾	Stuttgart, AR ²⁾	LSMean
1	Manokin	36	22	21	.	.	26
2	9594	41	23	20	.	.	28
3	Graham	38	22	18	.	.	26
4	Hutcheson	35	23	22	.	.	27
5	Dillon	44	27	20	.	.	30
6	PI423897	30	22	25	.	.	25
7	PI423912	30	16	17	.	.	21
8	PI561388	30	21	24	.	.	25
9	PI398434	35	20	20	.	.	25
10	PI398580	37	25	30	.	.	31
11	PI398610	34	18	21	.	.	24
12	PI398612	41	25	20	.	.	29
13	PI398833	32	14	19	.	.	21
14	PI398976	31	13	21	.	.	22
15	PI399044	37	20	24	.	.	27
16	PI399045	33	20	25	.	.	26
17	PI399122	42	22	23	.	.	29
18	PI407837	34	21	20	.	.	25
19	PI407910	37	22	18	.	.	26
20	PI407911	35	24	22	.	.	27
21	PI407975B	20	12	15	.	.	15
22	PI407993	29	22	21	.	.	24
23	PI407994	25	13	21	.	.	20
24	PI408037	36	21	26	.	.	28
25	PI408040-2	36	23	.	.	.	29
26	PI408041	34	25	22	.	.	27
27	PI408219	34	23	25	.	.	27
28	PI408250	32	14	21	.	.	22
29	PI408337	34	20	25	.	.	26
30	PI408339	36	19	24	.	.	26
31	PI417331	30	17	26	.	.	24
32	PI423759	31	21	23	.	.	25
33	PI423773	45	47	23	.	.	38
34	PI423900	45	28	25	.	.	32
35	PI424178B	35	23	15	.	.	24
36	PI424415	38	17	22	.	.	26
37	PI458073	40	21	24	.	.	28
38	PI471931	33	21	24	.	.	26
39	PI471938	35	26	21	.	.	27
40	PI506651	34	18	.	.	.	26
41	PI506660	23	16	24	.	.	21
42	PI507079	29	18	.	.	.	23
43	PI507098	36	14	34	.	.	28
44	PI507269	37	24	27	.	.	29
45	PI507369	27	14	23	.	.	21
46	PI508294	37	17	.	.	.	27
47	PI509098	28	13	26	.	.	22
48	PI509106	31	20	23	.	.	24
LSMean		34	20	22	.	.	26

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ This trait was not recorded at this location in 1998.

Table 38. Plant Lodging score (1=erect, 5=prostrate) of soybean accessions in SAGE Test 5 (primarily maturity groups IV and V) evaluated in 1998. Means are presented asLSMeans from the GLM procedure of SAS ¹⁾.

Code	Name	Galeena, MD	Greenville, MS	Keiser, AR	Kinston, NC ²⁾	Stuttgart, AR ³⁾	LSMean
1	Manokin	3.0	2.2	1.0	1.5	.	2.1
2	9594	2.8	2.0	1.5	1.5	.	2.1
3	Graham	2.5	2.0	1.1	1.5	.	1.9
4	Hutcheson	2.3	1.7	1.5	1.5	.	1.8
5	Dillon	3.0	2.2	2.1	0.9	.	2.4
6	PI423897	2.5	2.7	1.5	1.5	.	2.3
7	PI423912	1.8	2.0	0.9	1.5	.	1.6
8	PI561388	1.8	2.0	1.1	2.0	.	1.6
9	PI398434	4.5	3.0	1.5	3.5	.	3.0
10	PI398580	4.0	3.0	2.1	3.0	.	3.0
11	PI398610	3.5	2.2	1.1	2.9	.	2.3
12	PI398612	3.3	3.0	0.9	2.5	.	2.4
13	PI398833	4.5	3.0	2.5	3.0	.	3.3
14	PI398976	4.0	2.5	1.0	2.0	.	2.5
15	PI399044	3.3	2.0	3.0	2.0	.	2.8
16	PI399045	2.8	2.0	1.0	2.0	.	1.9
17	PI399122	3.5	2.7	1.5	3.5	.	2.6
18	PI407837	3.5	1.7	1.1	2.0	.	2.1
19	PI407910	3.5	2.0	0.9	2.0	.	2.1
20	PI407911	3.8	2.0	2.0	2.0	.	2.6
21	PI407975B	2.8	2.7	0.9	1.5	.	2.1
22	PI407993	4.3	3.0	1.1	3.0	.	2.8
23	PI407994	3.5	2.7	1.1	2.0	.	2.4
24	PI408037	3.3	2.0	1.1	2.5	.	2.1
25	PI408040-2	3.5	2.2	.	2.5	.	2.9
26	PI408041	3.3	2.3	1.1	3.0	.	2.2
27	PI408219	3.3	2.2	1.0	3.0	.	2.2
28	PI408250	4.3	3.5	1.0	3.0	.	2.9
29	PI408337	2.8	2.0	1.5	2.0	.	2.1
30	PI408339	2.5	2.0	1.9	2.5	.	2.1
31	PI417331	2.8	2.7	1.5	2.0	.	2.3
32	PI423759	4.5	2.0	1.9	3.0	.	2.8
33	PI423773	3.8	4.0	1.5	4.5	.	3.1
34	PI423900	4.5	2.5	0.9	3.0	.	2.6
35	PI424178B	3.3	2.7	0.9	3.0	.	2.3
36	PI424415	4.0	2.5	2.0	3.0	.	2.8
37	PI458073	3.0	2.0	1.0	2.0	.	2.0
38	PI471931	3.0	2.2	2.0	2.0	.	2.4
39	PI471938	3.3	2.0	0.9	3.0	.	2.1
40	PI506651	2.8	2.3	.	1.5	.	2.6
41	PI506660	1.5	2.5	2.1	1.5	.	2.0
42	PI507079	1.5	2.5	.	2.0	.	2.0
43	PI507098	3.0	2.0	3.1	3.0	.	2.7
44	PI507269	3.8	3.2	1.9	3.5	.	3.0
45	PI507369	2.5	1.8	2.5	1.5	.	2.3
46	PI508294	3.8	2.7	.	2.5	.	3.3
47	PI509098	3.0	2.7	1.0	3.0	.	2.3
48	PI509106	3.7	2.2	1.5	2.5	.	2.5
LSMean		3.2	2.4	1.5	2.4	.	2.4

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ This location is not included in overall lsmean due to high LSD value.

³⁾ This trait was not recorded at this location in 1998.

Table 39. Seed Weight (g/100 seed) of soybean accessions in SAGE Test 5 (primarily maturity groups IV and V) evaluated in 1998. Means are presented as LSMeans from the GLM procedure of SAS ¹⁾.

Code	Name	Galeena, MD ²⁾	Greenville, MS ²⁾	Keiser, AR ²⁾	Kinston, NC	Stuttgart, AR ²⁾	LSMean
1	Manokin	.	.	.	13.5	.	13.5
2	9594	.	.	.	18.5	.	18.5
3	Graham	.	.	.	17.0	.	17.0
4	Hutcheson	.	.	.	16.3	.	16.3
5	Dillon	.	.	.	16.5	.	16.5
6	PI423897	.	.	.	20.1	.	20.1
7	PI423912	.	.	.	29.2	.	29.2
8	PI561388	.	.	.	18.0	.	18.0
9	PI398434	.	.	.	8.7	.	8.7
10	PI398580	.	.	.	12.5	.	12.5
11	PI398610	.	.	.	11.4	.	11.4
12	PI398612	.	.	.	11.3	.	11.3
13	PI398833	.	.	.	11.3	.	11.3
14	PI398976	.	.	.	7.9	.	7.9
15	PI399044	.	.	.	13.5	.	13.5
16	PI399045	.	.	.	13.1	.	13.1
17	PI399122	.	.	.	9.6	.	9.6
18	PI407837	.	.	.	11.8	.	11.8
19	PI407910	.	.	.	13.0	.	13.0
20	PI407911	.	.	.	13.5	.	13.5
21	PI407975B	.	.	.	14.2	.	14.2
22	PI407993	.	.	.	27.5	.	27.5
23	PI407994	.	.	.	13.7	.	13.7
24	PI408037	.	.	.	15.6	.	15.6
25	PI408040-2	.	.	.	24.6	.	24.6
26	PI408041	.	.	.	16.1	.	16.1
27	PI408219	.	.	.	16.5	.	16.5
28	PI408250	.	.	.	7.5	.	7.5
29	PI408337	.	.	.	13.1	.	13.1
30	PI408339	.	.	.	12.7	.	12.7
31	PI417331	.	.	.	22.3	.	22.3
32	PI423759	.	.	.	9.6	.	9.6
33	PI423773	.	.	.	12.5	.	12.5
34	PI423900	.	.	.	14.5	.	14.5
35	PI424178B	.	.	.	9.7	.	9.7
36	PI424415	.	.	.	23.2	.	23.2
37	PI458073	.	.	.	16.5	.	16.5
38	PI471931	.	.	.	15.9	.	15.9
39	PI471938	.	.	.	9.8	.	9.8
40	PI506651	.	.	.	16.5	.	16.5
41	PI506660	.	.	.	21.4	.	21.4
42	PI507079	.	.	.	18.0	.	18.0
43	PI507098	.	.	.	15.6	.	15.6
44	PI507269	.	.	.	18.8	.	18.8
45	PI507369	.	.	.	17.0	.	17.0
46	PI508294	.	.	.	16.0	.	16.0
47	PI509098	.	.	.	9.0	.	9.0
48	PI509106	.	.	.	17.0	.	17.0
LSMean		.	.	.	15.2	.	15.2

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ This trait was not recorded at this location in 1998.

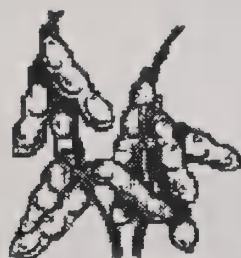
Table 40. Shattering score (0= none, 9=81-90% of pods shattered) of soybean accessions in SAGE Test 5 (primarily maturity groups IV and V) evaluated in 1998. Means are presented asLSMeans from the GLM procedure of SAS¹⁾. Shattering occurred after harvest and did not affect yield.

Code	Name	Galeena, MD	Greenville, MS ²⁾	Keiser, AR	Kinston, NC ³⁾	Stuttgart, AR ²⁾	LSMean
1	Manokin	1.0	.	1.0	1.0	.	1.0
2	9594	1.0	.	2.0	1.0	.	1.5
3	Graham	1.0	.	2.1	1.5	.	1.5
4	Hutcheson	1.0	.	1.5	1.5	.	1.3
5	Dillon	1.0	.	2.1	1.0	.	1.5
6	PI423897	4.5	.	2.0	2.5	.	3.3
7	PI423912	3.0	.	1.9	3.0	.	2.5
8	PI561388	2.5	.	2.1	1.0	.	2.3
9	PI398434	1.0	.	1.0	2.5	.	1.0
10	PI398580	1.0	.	1.1	1.0	.	1.0
11	PI398610	1.0	.	3.1	2.0	.	2.0
12	PI398612	1.5	.	0.9	2.0	.	1.2
13	PI398833	1.5	.	2.0	2.5	.	1.8
14	PI398976	1.0	.	2.0	1.0	.	1.5
15	PI399044	1.0	.	1.5	1.0	.	1.3
16	PI399045	1.0	.	1.0	1.0	.	1.0
17	PI399122	1.5	.	1.5	1.0	.	1.5
18	PI407837	1.5	.	2.1	3.0	.	1.8
19	PI407910	1.0	.	1.9	1.5	.	1.5
20	PI407911	1.5	.	1.5	2.0	.	1.5
21	PI407975B	1.5	.	1.9	1.0	.	1.7
22	PI407993	1.0	.	1.1	1.5	.	1.0
23	PI407994	1.0	.	2.1	1.0	.	1.5
24	PI408037	1.0	.	2.1	1.0	.	1.5
25	PI408040-2	2.0	.	.	2.0	.	2.0
26	PI408041	1.0	.	2.1	1.0	.	1.5
27	PI408219	2.0	.	2.0	2.0	.	2.0
28	PI408250	1.5	.	1.5	1.0	.	1.5
29	PI408337	1.0	.	1.5	1.0	.	1.3
30	PI408339	1.0	.	0.9	1.0	.	1.0
31	PI417331	1.5	.	2.0	4.0	.	1.8
32	PI423759	1.0	.	1.9	2.0	.	1.5
33	PI423773	1.0	.	2.0	3.5	.	1.5
34	PI423900	1.0	.	0.9	3.5	.	1.0
35	PI424178B	1.5	.	1.9	2.0	.	1.7
36	PI424415	2.0	.	1.5	2.0	.	1.8
37	PI458073	2.5	.	2.0	4.0	.	2.3
38	PI471931	1.0	.	1.5	1.0	.	1.3
39	PI471938	1.0	.	0.9	1.0	.	1.0
40	PI506651	4.0	.	.	1.0	.	4.0
41	PI506660	3.5	.	1.1	3.0	.	2.3
42	PI507079	2.0	.	.	1.0	.	2.0
43	PI507098	2.5	.	1.1	1.0	.	1.8
44	PI507269	3.0	.	1.9	3.0	.	2.5
45	PI507369	4.0	.	1.0	1.0	.	2.5
46	PI508294	1.5	.	.	1.0	.	1.5
47	PI509098	1.5	.	2.0	1.0	.	1.8
48	PI509106	2.5	.	1.5	3.0	.	2.0
LSMean		1.7	.	2.0	1.7	.	1.7

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ This trait was not recorded at this location in 1998.

³⁾ This location is not included in overall lsmean due to high LSD value.



TEST 6

(Primarily maturity group V and Later)

SUMMARY ACROSS LOCATIONS IN 1998

Table 41. Morphological characteristics and origin of accessions in SAGE Test 6 (primarily maturity group V and later) evaluated in 1998.

Code	PI Number	Accession Name	Origin	Flower Color ¹⁾	Pubescence Color ²⁾	Stem Termin. ³⁾	Podwall Color ⁴⁾	Hilum Color ⁵⁾	Seed Coat Color ⁶⁾	Maturity Group ⁷⁾
5	PI506514	Akishirome	Japan	P	G	D	Br	Y	Y	VI
6	PI594172B	Gogaku	Japan	P	G	D	Br	lb	Y	VII
7	FC031933		Unknown	W	T	D	Tn	Br	Y	VI
8	FC032175		Unknown	W	G	D	Tn	Bl	Y	VI
9	PI157440	Kin-du	Korea, South	W	G	D	Br	Bf	Y	V
10	PI198078	Punjab-1	India	P	T	D	Tn	Br	Y	VII
11	PI221717		South Africa	W	G	D	Br	Bf	Y	VI
12	PI408104		Korea, South	P	G	D	Br	Br	Gn	V
13	PI417263	Sakyuu Ki Mame	Japan	W	T	D	Br	Br	Y	V
14	PI423928	Uda Daizu	Japan	P	G	D	Br	Bf	Y	V
15	PI424390		Korea, South	P	T	D	Tn	Bl	Y	V
16	PI437726	Ti-jue-baj	China	W	G	D	Tn	Lbf	Y	VI
17	PI494851		Zambia	W	G	D	Tn	Lbf	Y	VI
18	PI507256	Shiro Chonkon	Japan	P	G	D	Tn	Bf	Y	V
19	PI507403	Tousan 65	Japan	P	G	D	Tn	Y	Y	V

¹⁾ P= Purple, W= White, Dp= Dark purple.

²⁾ G= Gray, T= Tawny.

³⁾ D= Determinate, N= Indeterminate.

⁴⁾ Br= Brown, Tn= Tan, Dbr= Dark Brown.

⁵⁾ Y= Yellow, Bf= Buff, Lbf= Light buff, lbf= Imperfect Black, Br= Brown.

⁶⁾ Y= Yellow, Lgnr= Light green, Gn= Green.

⁷⁾ Maturity group assigned by USDA Soybean Germplasm Collection.

Table 42. Overall agronomic performance of Asian soybean varieties in the SAGE Test 6 (primarily maturity groups V and later) evaluated in 1998. Means are presented as LSMeans from the GLM procedure of SAS ¹⁾.

Code	PI Number	Yield (bu/a) ²⁾	Maturity (Sept 1=1)	Plant Height (in)	Lodging (1 to 5) ³⁾	100-Seed Weight (g)	Seed Quality (1 to 5) ³⁾	Shattering (0 to 9) ⁴⁾	Mottling (1 to 5) ³⁾
1	Graham	44.9	25	29	2.2	14.6	.	0.5	3.3
2	Boggs	50.4	35	33	2.5	14.2	.	0.5	1.5
3	Dillon	50.0	33	36	1.9	15.5	.	0.5	2.0
4	Haskell	45.8	46	41	3.0	17.9	.	0.5	1.5
5	PI506514	30.9	32	27	1.9	17.5	.	3.5	3.5
6	PI594172B	27.7	40	35	2.9	15.9	.	3.3	1.8
7	FC031933	35.8	33	35	2.9	12.5	.	1.5	2.5
8	FC032175	37.9	34	33	2.8	12.7	.	0.5	3.0
9	PI157440	37.1	28	35	2.7	13.9	.	2.5	2.8
10	PI198078	33.8	45	36	3.8	13.3	.	1.4	2.0
11	PI221717	35.3	43	37	2.4	15.1	.	0.5	1.5
12	PI408104	32.5	27	32	2.7	14.5	.	2.8	3.3
13	PI417263	22.2	25	22	2.1	14.9	.	2.3	4.0
14	PI423928	36.4	27	30	2.2	20.1	.	4.8	3.5
15	PI424390	28.5	29	26	2.5	8.6	.	1.5	2.5
16	PI437726	46.1	31	38	3.3	15.9	.	0.5	2.5
17	PI494851	46.5	33	38	2.6	15.0	.	0.5	2.0
18	PI507256	24.8	23	27	2.1	21.1	.	5.3	3.8
19	PI507403	26.7	26	28	2.8	17.7	.	5.2	4.0

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 5 edition. Cary, NC. 956 pp.

²⁾ Four locations were used in calculating the yield LSMeans, see individual location tables for the rest of the traits.

³⁾ 1=best, 5=worst.

⁴⁾ 0=none; 9=80-90% shattering. Shattering occurred after harvest and thus, did not affect yield results.

Table 6. Seed protein, oil and fatty acid analysis of exotic soybean varieties in the SAGE Test 6 (primarily maturity group VI and later) evaluated in 1998. Individual values are the average of 3 locations (one replication per location) and reported as LSMeans from the GLM procedure of SAS ¹⁾.

CODE	Entry	Oil	Pro	Fatty Acid Composition ²⁾					Total Sats. ³⁾
				16:0	18:0	18:1	18:2	18:3	
				%					
1	GRAHAM	21.3	41.5	10.9	4.1	20.8	57.0	7.1	15.1
2	BOGGS	20.1	43.6	10.8	2.9	25.7	54.5	6.0	13.7
3	DILLON	19.8	43.8	10.0	3.2	26.6	54.2	5.9	13.2
4	HASKELL	20.3	42.5	11.2	4.2	23.0	55.1	6.5	15.4
5	PI506514	19.5	43.5	10.5	3.0	20.7	58.6	7.2	13.5
6	PI594172B	19.9	44.2	10.9	3.5	26.5	52.9	6.2	14.4
7	FC031933	18.6	44.0	11.4	5.0	25.1	52.1	6.5	16.4
8	FC032175	20.4	43.2	10.8	4.7	22.2	55.9	6.3	15.5
9	PI157440	18.9	43.0	11.7	3.7	23.1	54.9	6.6	15.4
10	PI198078	16.9	45.2	10.6	3.8	27.8	52.0	5.7	14.4
11	PI221717	19.5	43.8	10.2	3.2	25.2	55.9	5.4	13.4
12	PI408104	18.4	44.2	11.2	3.8	24.2	54.0	6.7	15.1
13	PI417263	19.6	43.5	11.6	3.6	23.1	54.8	6.9	15.2
14	PI423928	19.3	44.5	10.4	3.8	31.9	47.4	6.4	14.2
15	PI424390	15.9	46.0	11.5	3.7	24.0	53.7	7.0	15.3
16	PI437726	19.8	43.1	11.2	3.4	26.0	54.1	5.2	14.6
17	PI494851	20.1	43.0	11.0	3.3	26.8	53.4	5.4	14.3
18	PI507256	17.8	44.8	12.2	3.7	32.1	47.0	4.9	15.9
19	PI507403	18.3	43.4	11.5	4.0	24.5	53.5	6.6	15.5
LSMEAN		19.2	43.7	11.0	3.7	25.2	53.7	6.2	14.8

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ 16:0=Palmitic acid; 18:0=Stearic acid; 18:1=Oleic acid; 18:2=Linoleic acid; 18:3=Linolenic acid.

³⁾ Total of saturated fatty acids (16:0 + 18:0).

TEST 6

(Primarily maturity group V and Later)

INDIVIDUAL LOCATIONS IN 1998

Table 44. Yield (bu/a) of soybean accessions in SAGE Test 6 (primarily maturity group V and later) evaluated in 1998. Means are presented as LSMeans from the GLM procedure of SAS¹⁾.

Code	Name	Greenville, MS	Kinston, NC ²⁾	Stuttgart, AR	Plains, GA ³⁾	Rohwer, AR	LSMean
1	Graham	53.1	58.4	48.3	42.9	33.3	44.9
2	Boggs	49.7	54.4	70.1	49.4	31.4	50.4
3	Dillon	52.6	68.1	68.8	49.4	28.8	50.0
4	Haskell	41.1	86.6	67.1	61.5	29.2	45.8
5	PI506514	28.7	17.8	43.0	18.5	20.8	30.9
6	PI594172B	18.7	64.7	49.6	14.1	14.7	27.7
7	FC031933	36.8	31.0	51.1	25.7	19.6	35.8
8	FC032175	34.8	29.9	51.6	34.7	27.3	37.9
9	PI157440	33.0	32.0	54.0	20.7	24.4	37.1
10	PI198078	25.4	30.6	52.8	31.4	23.3	33.8
11	PI221717	33.5	53.7	57.4	40.6	14.9	35.3
12	PI408104	23.9	28.6	54.3	19.6	19.5	32.5
13	PI417263	21.1	19.9	25.3	18.8	20.3	22.2
14	PI423928	37.8	24.3	52.7	13.1	18.8	36.4
15	PI424390	22.5	26.3	44.4	23.3	18.6	28.5
16	PI437726	46.3	62.2	62.4	45.5	29.5	46.1
17	PI494851	44.0	63.9	62.0	43.4	33.6	46.5
18	PI507256	25.8	12.6	32.3	6.8	16.2	24.8
19	PI507403	29.1	21.7	35.0	14.7	16.1	26.7
LSMean		34.6	41.4	51.7	30.2	23.2	36.5
LSD(0.05) ⁴⁾		7.1	17.6	10.1	7.3	5.2	4.3
CV (%)		10	20	9	11	11	10

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ This location is not included in overall lsmeans due to high LSD value.

³⁾ Yield data were not used from this location due to high shattering before harvest, this location included inlsmeans for all other traits recorded at this location.

⁴⁾ A single LSD value is given for each location although LSMeans are presented. The average LSD's values closely approximate the individual pairwise LSD's obtained from the LSMean provided by SAS.

Table 45. Maturity Date (September 1 = 1) of soybean accessions in SAGE Test 6 (primarily maturity group V and later) evaluated in 1998. Means are presented as LSMs from the GLM procedure of SAS¹⁾.

Code	Name	Greenville, MS	Kinston, NC ²⁾	Stuttgart, AR ³⁾	Plains, GA ³⁾	Rohwer, AR	LSMean
1	Graham	24	45	.	.	26	25
2	Boggs	39	58	.	.	31	35
3	Dillon	34	51	.	.	31	33
4	Haskell	48	60	.	.	44	46
5	PI506514	35	49	.	.	30	32
6	PI594172B	46	.	.	.	34	40
7	FC031933	38	51	.	.	27	33
8	FC032175	40	48	.	.	29	34
9	PI157440	27	45	.	.	29	28
10	PI198078	45	58	.	.	45	45
11	PI221717	44	60	.	.	41	43
12	PI408104	28	47	.	.	27	27
13	PI417263	24	39	.	.	26	25
14	PI423928	29	44	.	.	26	27
15	PI424390	32	48	.	.	26	29
16	PI437726	32	53	.	.	29	31
17	PI494851	35	57	.	.	31	33
18	PI507256	19	43	.	.	27	23
19	PI507403	26	43	.	.	26	26
LSMean		34	50	.	.	31	38

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ This location is not included in overall lsmeans due to high LSD value.

³⁾ This trait was not recorded at this location in 1998.

Table 46. Plant Height (inches) of soybean accessions in SAGE Test 6 (primarily maturity group V and later) evaluated in 1998. Means are presented as LSMeans from the GLM procedure of SAS¹⁾.

Code	Name	Greenville, MS	Kinston, NC ²⁾	Stuttgart, AR ²⁾	Plains, GA	Rohwer, AR	LSMean
1	Graham	22	.	.	34	31	29
2	Boggs	32	.	.	37	32	33
3	Dillon	37	.	.	40	31	36
4	Haskell	40	.	.	41	44	41
5	PI506514	23	.	.	27	31	27
6	PI594172B	34	.	.	35	36	35
7	FC031933	35	.	.	33	37	35
8	FC032175	36	.	.	32	32	33
9	PI157440	33	.	.	34	39	35
10	PI198078	35	.	.	35	38	36
11	PI221717	36	.	.	38	39	37
12	PI408104	32	.	.	29	36	32
13	PI417263	19	.	.	22	26	22
14	PI423928	28	.	.	28	35	30
15	PI424390	29	.	.	23	28	26
16	PI437726	37	.	.	39	38	38
17	PI494851	36	.	.	41	37	38
18	PI507256	22	.	.	28	32	27
19	PI507403	27	.	.	28	30	28
LSMean		31	.	.	33	34	33

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ This trait was not recorded at this location in 1998.

Table 47. Plant Lodging score (1=erect, 5=prostrate) of soybean accessions in SAGE Test 6 (primarily maturity group V and later) evaluated in 1998. Means are presented as LSM means from the GLM procedure of SAS¹⁾.

Code	Name	Greenville, MS	Kinston, NC ²⁾	Stuttgart, AR ³⁾	Plains, GA	Rohwer, AR	LSMean
1	Graham	2.0	2.0	.	3.5	1.0	2.2
2	Boggs	2.0	2.5	.	4.0	1.5	2.5
3	Dillon	2.3	2.0	.	2.5	1.0	1.9
4	Haskell	4.0	3.5	.	3.0	2.0	3.0
5	PI506514	2.0	2.5	.	2.7	1.0	1.9
6	PI594172B	3.0	.	.	3.7	2.0	2.9
7	FC031933	3.8	4.0	.	4.0	1.0	2.9
8	FC032175	3.0	3.0	.	4.2	1.0	2.8
9	PI157440	3.5	2.5	.	3.5	1.0	2.7
10	PI198078	4.0	3.5	.	4.7	2.5	3.8
11	PI221717	3.0	3.0	.	3.2	1.0	2.4
12	PI408104	2.8	2.5	.	4.2	1.0	2.7
13	PI417263	2.0	2.0	.	3.2	1.0	2.1
14	PI423928	2.8	1.5	.	2.7	1.0	2.2
15	PI424390	3.3	3.5	.	3.2	1.0	2.5
16	PI437726	3.5	4.0	.	4.7	1.5	3.3
17	PI494851	3.3	4.0	.	3.5	1.0	2.6
18	PI507256	2.0	2.0	.	3.2	1.0	2.1
19	PI507403	3.2	2.5	.	4.0	1.0	2.8
LSMean		2.9	2.8	.	3.6	1.2	2.6

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ This location is not included in overall lsmeans due to high LSD value.

³⁾ This trait was not recorded at this location in 1998.

Table 48. Seed Weight (g/100 seed) of soybean accessions in SAGE Test 6 (primarily maturity group V and later) evaluated in 1998. Means are presented as LSMs from the GLM procedure of SAS¹⁾.

Code	Name	Greenville, MS ²⁾	Kinston, NC ³⁾	Stuttgart, AR ²⁾	Plains, GA	Rohwer, AR ²⁾	LSMean
1	Graham	.	17.2	.	14.7	.	14.7
2	Boggs	.	17.7	.	14.2	.	14.2
3	Dillon	.	17.5	.	15.5	.	15.5
4	Haskell	.	19.2	.	17.9	.	17.9
5	PI506514	.	20.7	.	17.5	.	17.5
6	PI594172B	.	22.1	.	15.9	.	15.9
7	FC031933	.	14.9	.	12.5	.	12.5
8	FC032175	.	13.3	.	12.7	.	12.7
9	PI157440	.	14.7	.	13.9	.	13.9
10	PI198078	.	16.1	.	13.3	.	13.3
11	PI221717	.	16.2	.	15.1	.	15.1
12	PI408104	.	16.6	.	14.5	.	14.5
13	PI417263	.	18.2	.	14.9	.	14.9
14	PI423928	.	20.5	.	20.1	.	20.1
15	PI424390	.	13.4	.	8.6	.	8.6
16	PI437726	.	16.7	.	15.9	.	15.9
17	PI494851	.	18.5	.	15.0	.	15.0
18	PI507256	.	23.1	.	21.1	.	21.1
19	PI507403	.	23.5	.	17.7	.	17.7
LSMean		.	17.9	.	15.3	.	15.3

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ This trait was not recorded at this location in 1998.

³⁾ This location is not included in overall lsmeans due to high LSD value.

Table 49. Shattering score (0= none, 9=81-90% of pods shattered) of soybean accessions in SAGE Test 6 (primarily maturity group V and later) evaluated in 1998. Means are presented as LSMeans from the GLM procedure of SAS ¹⁾. Shattering occurred after harvest and did not affect yield.

Code	Name	Greenville, MS ²⁾	Kinston, NC ³⁾	Stuttgart, AR ²⁾	Plains, GA	Rohwer, AR	LSMean
1	Graham	.	1.0	.	0.0	1.0	0.5
2	Boggs	.	1.0	.	0.0	1.0	0.5
3	Dillon	.	1.0	.	0.0	1.0	0.5
4	Haskell	.	1.0	.	0.0	1.0	0.5
5	PI506514	.	2.5	.	4.5	2.5	3.5
6	PI594172B	.	1.0	.	5.5	1.0	3.3
7	FC031933	.	1.0	.	2.0	1.0	1.5
8	FC032175	.	1.0	.	0.0	1.0	0.5
9	PI157440	.	1.5	.	4.0	1.0	2.5
10	PI198078	.	1.0	.	1.8	1.0	1.4
11	PI221717	.	1.0	.	0.0	1.0	0.5
12	PI408104	.	1.0	.	4.0	1.5	2.8
13	PI417263	.	3.0	.	3.0	1.5	2.3
14	PI423928	.	3.0	.	8.0	1.5	4.8
15	PI424390	.	1.0	.	2.0	1.0	1.5
16	PI437726	.	1.0	.	0.0	1.0	0.5
17	PI494851	.	1.0	.	0.0	1.0	0.5
18	PI507256	.	3.5	.	6.5	4.0	5.3
19	PI507403	.	2.5	.	7.5	3.0	5.2
LSMean		.	1.5	.	2.6	1.4	2.0

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ This trait was not recorded at this location in 1998.

³⁾ This location is not included in overall lsmeans due to high LSD value.

Table 50. Mottling score (1= good, 5=poor) of soybean accessions in SAGE Test 6 (primarily maturity group V and later) evaluated in 1998. Means are presented as LSMeans from the GLM procedure of SAS ¹⁾.

Code	Name	Greenville, MS ²⁾	Kinston, NC ²⁾	Stuttgart, AR ²⁾	Plains, GA	Rohwer, AR ²⁾	LSMean
1	Graham	.	.	.	3.3	.	3.3
2	Boggs	.	.	.	1.5	.	1.5
3	Dillon	.	.	.	2.0	.	2.0
4	Haskell	.	.	.	1.5	.	1.5
5	PI506514	.	.	.	3.5	.	3.5
6	PI594172B	.	.	.	1.8	.	1.8
7	FC031933	.	.	.	2.5	.	2.5
8	FC032175	.	.	.	3.0	.	3.0
9	PI157440	.	.	.	2.8	.	2.8
10	PI198078	.	.	.	2.0	.	2.0
11	PI221717	.	.	.	1.5	.	1.5
12	PI408104	.	.	.	3.3	.	3.3
13	PI417263	.	.	.	4.0	.	4.0
14	PI423928	.	.	.	3.5	.	3.5
15	PI424390	.	.	.	2.5	.	2.5
16	PI437726	.	.	.	2.5	.	2.5
17	PI494851	.	.	.	2.0	.	2.0
18	PI507256	.	.	.	3.8	.	3.8
19	PI507403	.	.	.	4.0	.	4.0
LSMean		.	.	.	2.7	.	2.7

¹⁾ SAS Institute Inc. 1985. SAS user's guide: Statistics, Version 6 edition. Cary, NC. 956 pp.

²⁾ This trait was not recorded at this location in 1998.



This project was supported by the

UNITED SOYBEAN BOARD

(USB Project 9211)

in cooperation with the

USDA-ARS

and other agencies listed on the cover of this document.



All accessions reported here are freely available for hybridization from the USDA-ARS Soybean Germplasm Collection and may be obtained by request from Randall Nelson *via* email at rlnelson@uiuc.edu or *via* FAX at 217-333-4639.